'Super' or just 'above average'? Supershedders and the transmission of *Escherichia coli* O157:H7 among feedlot cattle.

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Supplementary information

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1 MCMC algorithm

The algorithm of O'Neill and Roberts [1], which was originally intended to update the missing infection times of individuals in a continuous time SIR epidemic model when the removal times are known, requires some minor modifications before it can be applied successfully to our discrete time SIS epidemic model with repeat sampling. In the original algorithm there are 3 steps.

1. **Move** – A infection time is proposed to be moved to some other time drawn uniformly at random from all permissible times.
2. **Add** – An additional infection time is proposed to be added, chosen uniformly at random from all permissible times.
3. **Remove** – An infection time is proposed to be removed.

In each case the proposal is either accepted or rejected according to the usual Metropolis-Hastings acceptance probability. Importantly the Add and Remove steps are mutual inverses, which allows the probability of the reverse jump being proposed to be calculated. The Move step is a self-inverse.

It is fairly trivial to adapt this procedure from an SIR model with known removal times to an SIS model with unknown removal times, simply by allowing multiple infections and treating the removal times along the same lines as the infection times. In the 'Move' step the removal times are updated in exactly the same way as the infection times. In the 'Add' step both an infection time and removal time are generated together, with the constraint that the removal time must be after the infection time. If the removal time occurs outside of the study period then the individual is assumed to remain infectious. Since the negative binomial distribution for the infectious periods leaves us with a non-Markovian model, and so to calculate the likelihood we need to make an assumption about the time of infection for the individuals that are infected when the study begins. For simplicity, we have assumed that they are all infected on day 1. In the 'Remove' step, both the infection time and removal time (if present) are deleted together.

However, the repeat sampling in our study produces an added difficulty that prevents this algorithm from reaching every possible epidemic state. For example suppose that a particular individual has two positive tests separated by several days during which the individual was not tested. Further, suppose that the Markov chain starts from a state in which the individual is infected throughout this period. It may also have been the case that the individual managed to clear the infection after the first test, but was reinfected before the second test. Since we have assumed that the tests have perfect specificity, any proposal that suggests the individual

was not infected on either of the test days will automatically be rejected. It is therefore not possible to construct a series of steps consisting of 'Add', 'Remove' and 'Move' that allows the Markov chain to travel between these two states.

To overcome this limitation we generalised the 'Add' and 'Remove' proposals so that, rather than just adding and removing periods of infection, they could also add and remove periods of susceptibility. More precisely, in the 'Add' step, we choose a period during which a given individual did not change their infection status and then proposed that for a subset of this period their infection status was reversed. Likewise in the 'Remove' step we select an entire episode during which their infection status was unchanged and reverse this whole period, therefore joining the two neighbouring periods together.

The efficiency of this algorithm depends on the size of the blocks that are proposed to be reversed. If the blocks are too large then they no longer relate to the data and so are almost always rejected; whilst if the blocks are too small the proposals ignore the autocorrelation structure present in the individual's colonization history. In order to control and optimize the block size, we imposed a maximum number of days that could be changed by a single proposal, denoted by M. By examining pilot runs with M between 1 and 20, we found that $M = 4$ produced the largest average number of days accepted for reversal. This was approximately the same as the average number of days between tests.

The precise details of our algorithm are given below. Let $\boldsymbol{t} = (t_1, t_2, \ldots, t_C)$ be the times at which the colonization status of a given animal changes, i.e. for each $k \in \{1, \ldots, C\}$, $X_{p,i,t_k} \neq X_{p,i,t_k+1}$.

1. Move
   (a) Choose k uniformly at random from $\{1, \ldots, C\}$.
   (b) Let $A = (\{t_{k-1}+1, \ldots, t_{k+1}-1\} \cap \{t_k - M, \ldots, t_k + M\}) \setminus \{t_k\}$ be the set of acceptable times to propose.
   (c) Choose t'_k uniformly at random from A, and form $\boldsymbol{t}' = (t_1, \ldots, t'_k, \ldots, t_C)$.
   (d) Let $A' = (\{t_{k-1}+1, \ldots, t_{k+1}-1\} \cap \{t'_k - M, \ldots, t'_k + M\}) \setminus \{t'_k\}$ be the set of acceptable times to propose from t'_k.
   (e) Accept proposal $t_k \mapsto t'_k$ with probability $\min\{1, \frac{\pi(\boldsymbol{t}')|A|}{\pi(\boldsymbol{t})|A'|}\}$, where π is the posterior density.

2. Add

   (a) Let $B = \{t : X_{p,i,t} = X_{p,i,t+1} = X_{p,i,t+2}\}$ be the set of acceptable beginning times of a new block.

   (b) Choose b uniformly at random from B.

   (c) Let $n = \min\{k : t_k > b\}$ be the next block.

   (d) Let $E = \{b+1, \ldots, t_n - 1\} \cap \{b+1, \ldots, b+M\}$ be the set of acceptable end times of a new block starting at b.

   (e) Choose e uniformly at random from E and form $\boldsymbol{t}' = (t_1, \ldots, t_{n-1}, b, e, t_n, \ldots, t_C)$.

   (f) Let R' be the set of acceptable blocks that can be removed from $\boldsymbol{t}'$ (see Remove step).

   (g) Accept proposal $\boldsymbol{t} \mapsto \boldsymbol{t}'$ with probability $\min\{1, \frac{\pi(\boldsymbol{t}')|B||E|}{\pi(\boldsymbol{t})|R'|}\}$.

3. Remove

   (a) Let $R = \{k : t_k + M \geq t_{k+1}\}$ be the set of acceptable blocks that can be removed from $\boldsymbol{t}$.

   (b) Choose r uniformly from R and form $\boldsymbol{t}' = (t_1, \ldots, t_{r-1}, t_{r+2}, \ldots, t_C)$.

   (c) Let B' be the set of acceptable beginning times of a new block in $\boldsymbol{t}'$ (see Add step).

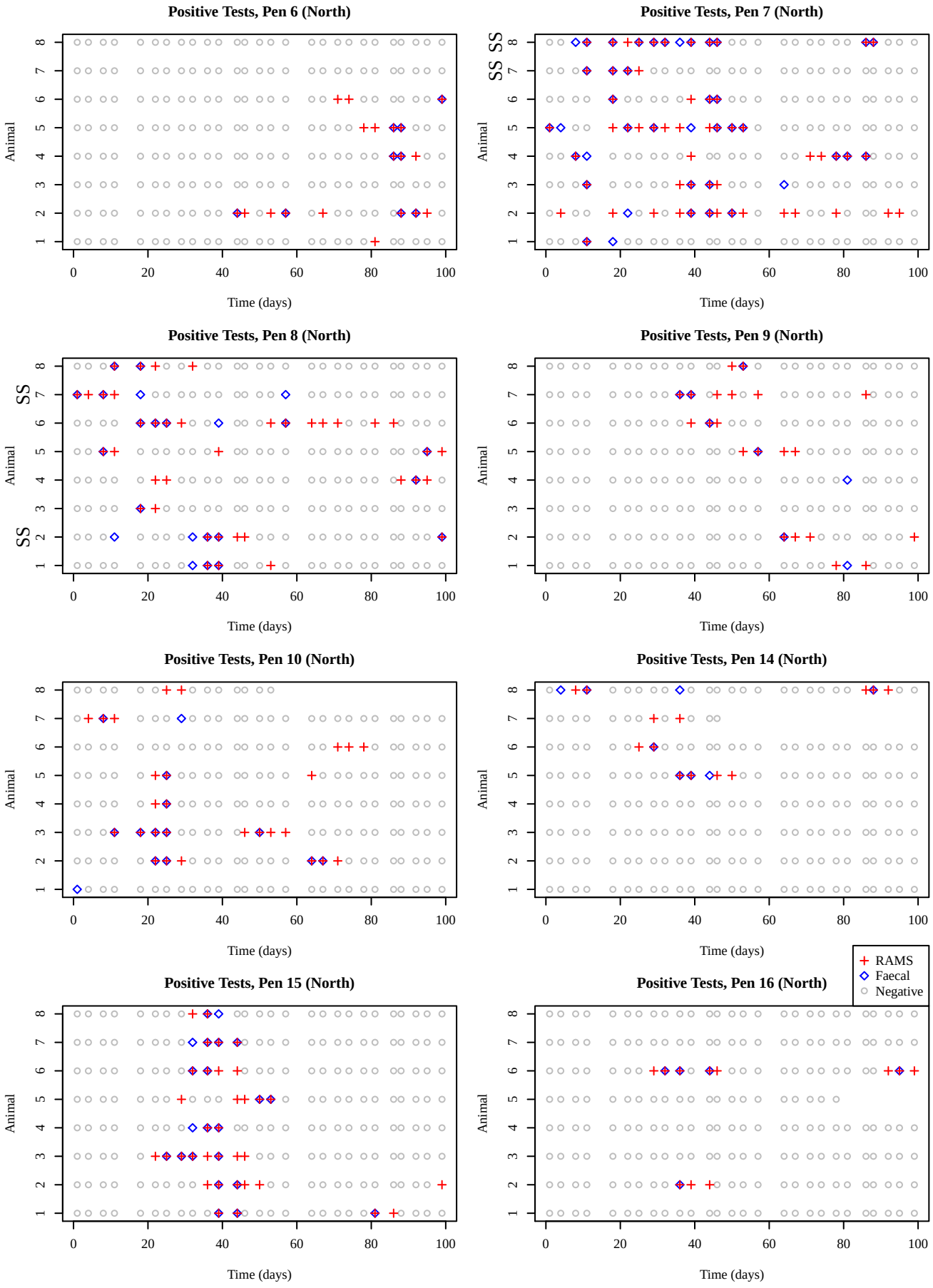
   (d) Let E' be the set of acceptable end times of a new block in $\boldsymbol{t}'$ starting at t_r (see Add step).

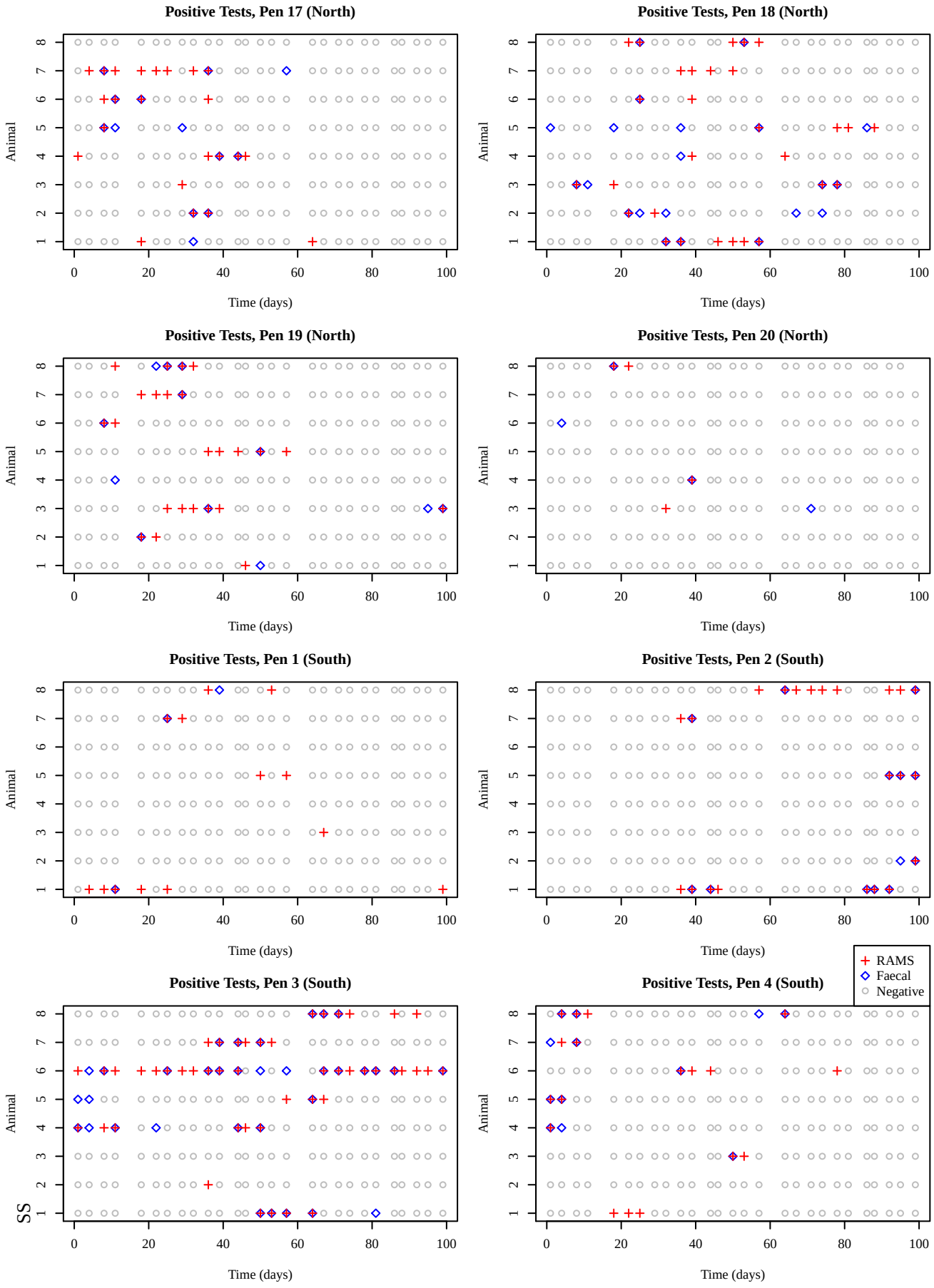
   (e) Accept proposal $\boldsymbol{t} \mapsto \boldsymbol{t}'$ with probability $\min\{1, \frac{\pi(\boldsymbol{t}')|R|}{\pi(\boldsymbol{t})|B'||E'|}\}$.

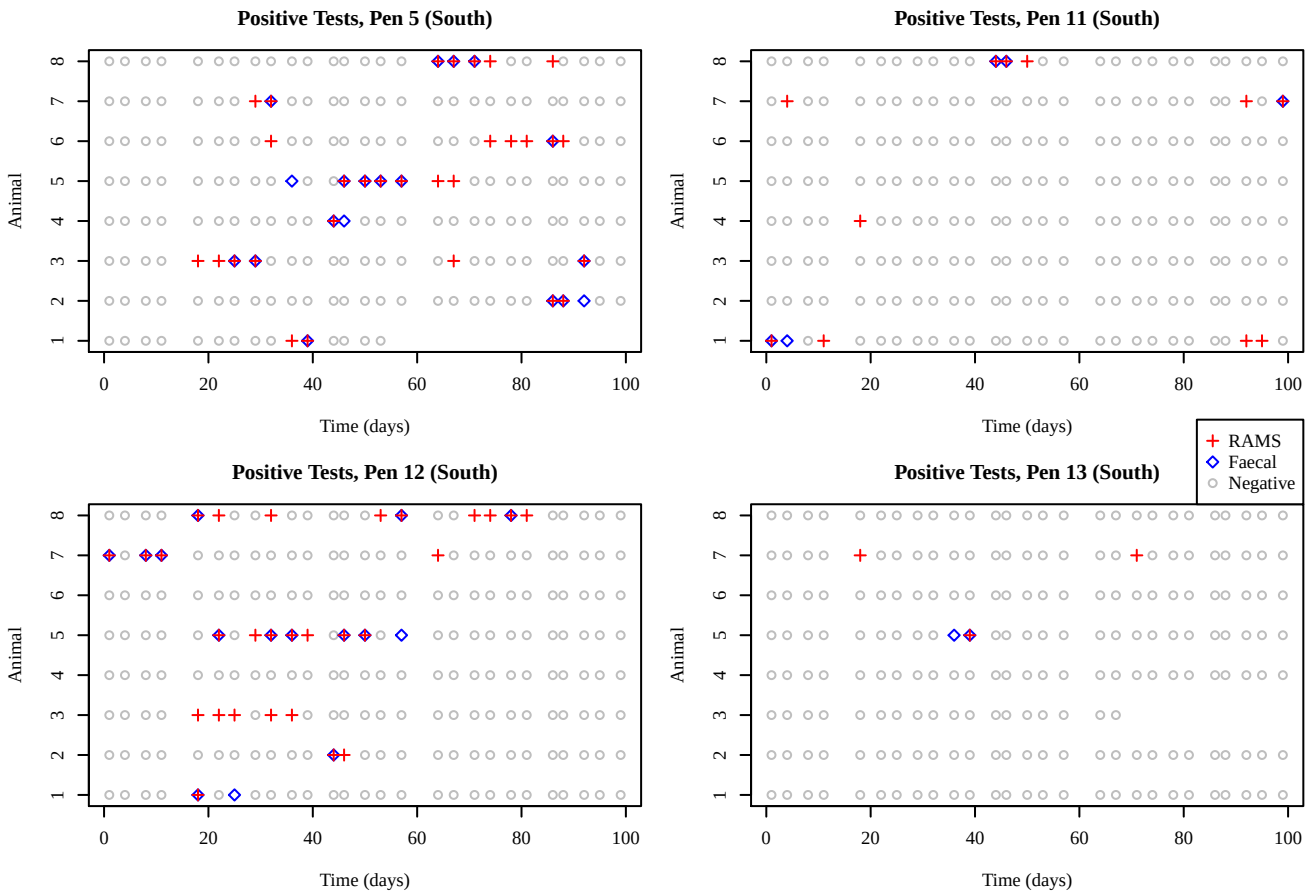
For the purposes of the Add and Remove steps in this algorithm $t_1 = 0$ and $t_C = T$ (the final day in the study) to allow incomplete blocks to be added and removed at the ends of the study period.

2 Positive tests

E. coli O157:H7 positive tests for each of the 20 study pens. The letters "SS" indicate that the animal was identified as being a supershedder in [2].

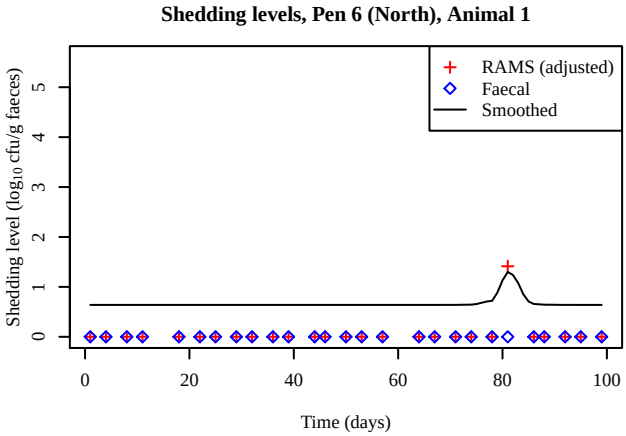

Positive Tests, Pen 6 (North)
Positive Tests, Pen 7 (North)
Positive Tests, Pen 8 (North)
Positive Tests, Pen 9 (North)
Positive Tests, Pen 10 (North)
Positive Tests, Pen 14 (North)
Positive Tests, Pen 15 (North)
Positive Tests, Pen 16 (North)
Animal
Time (days)
SS
RAMS
Faecal
Negative

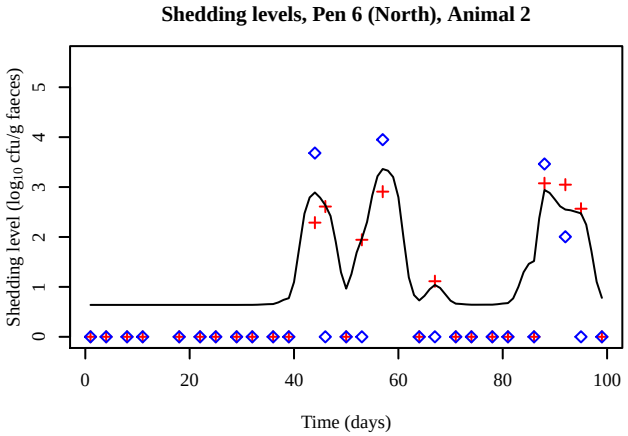

Positive Tests, Pen 17 (North)
Positive Tests, Pen 18 (North)
Positive Tests, Pen 19 (North)
Positive Tests, Pen 20 (North)
Positive Tests, Pen 1 (South)
Positive Tests, Pen 2 (South)
Positive Tests, Pen 3 (South)
Positive Tests, Pen 4 (South)
Animal
Time (days)
SS
RAMS
Faecal
Negative


Positive Tests, Pen 5 (South)
Positive Tests, Pen 11 (South)
Positive Tests, Pen 12 (South)
Positive Tests, Pen 13 (South)
Animal
Time (days)
RAMS
Faecal
Negative

3 Shedding levels

Measured shedding levels of *E. coli* O157:H7 and exponentially smoothed shedding levels for each animal in the study. Plots are arranged so that each page constitutes the animals from a single pen. The letters "SS" indicate that the animal was identified as being a supershedder in [2].


Shedding levels, Pen 6 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)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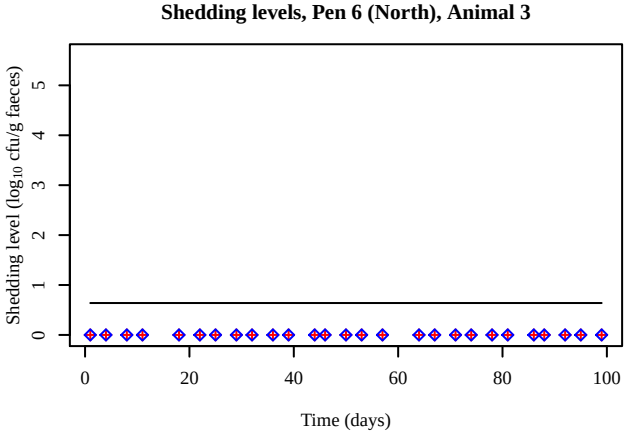
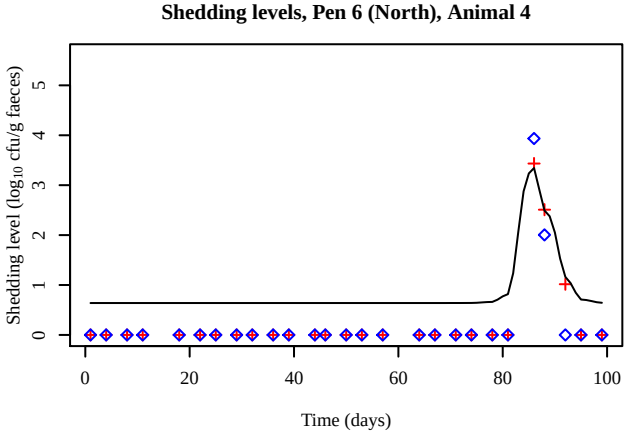
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 6 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)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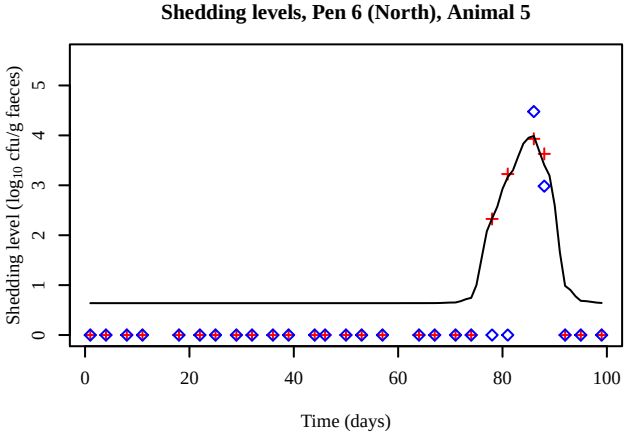
Shedding level (log10 cfu/g faeces)
Time (days)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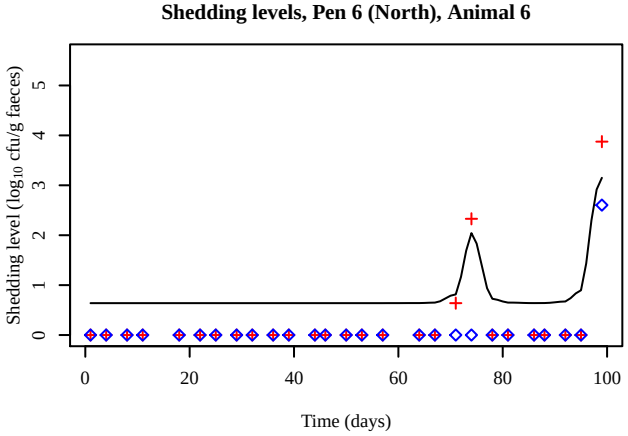
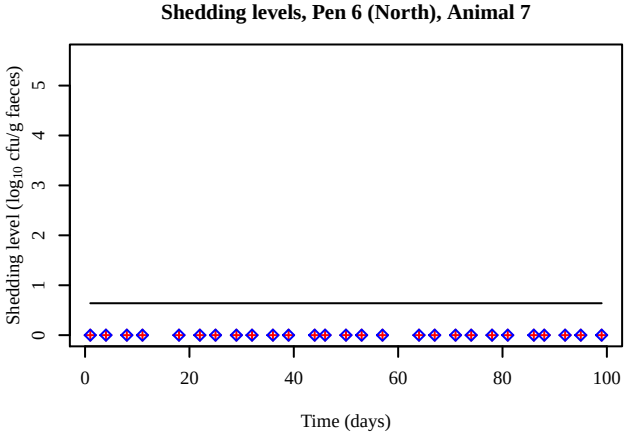
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 6 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)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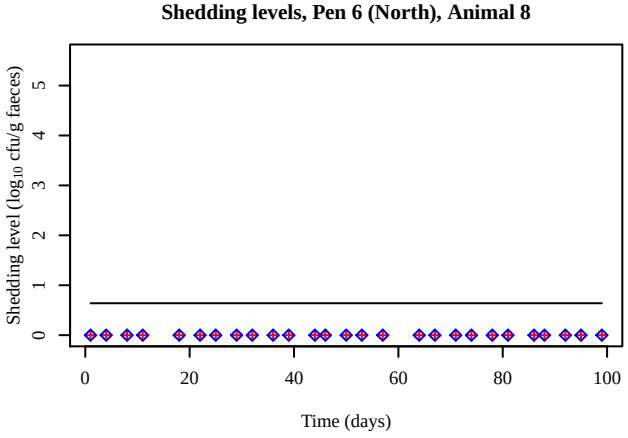
Shedding level (log10 cfu/g faeces)
Time (days)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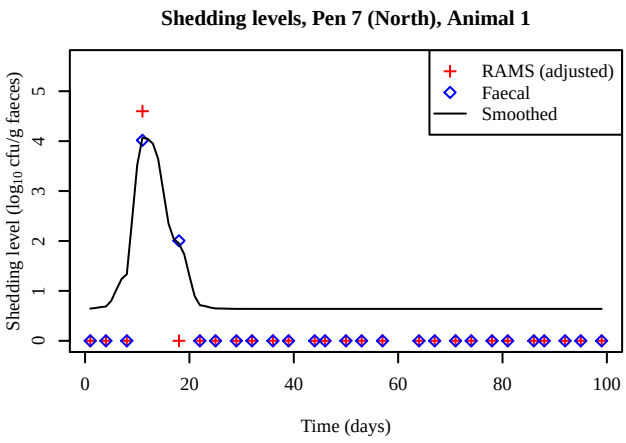
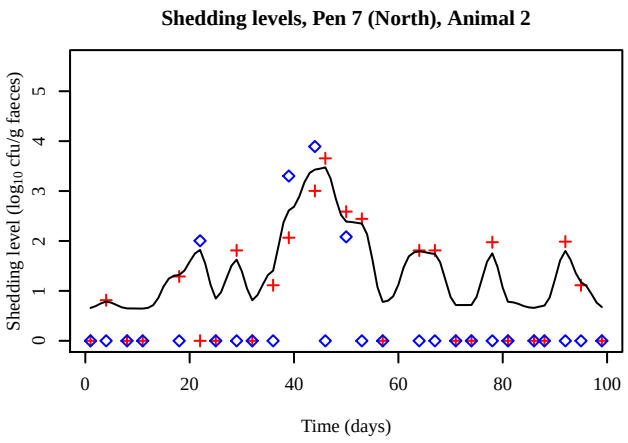
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 7 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)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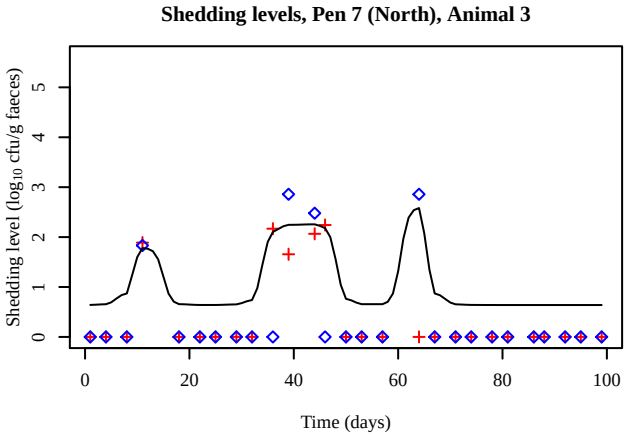
Shedding level (log10 cfu/g faeces)
Time (days)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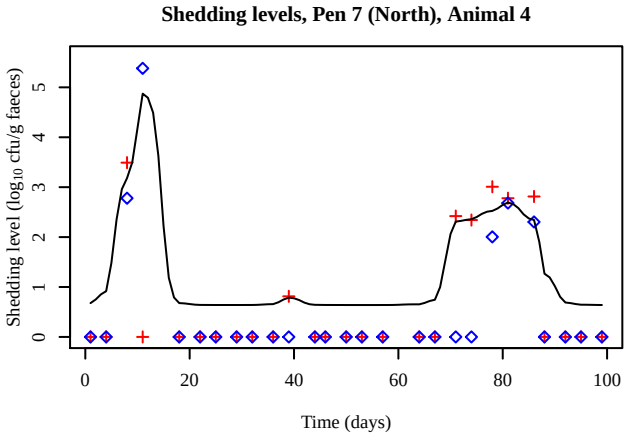
Shedding level (log10 cfu/g faeces)
Time (days)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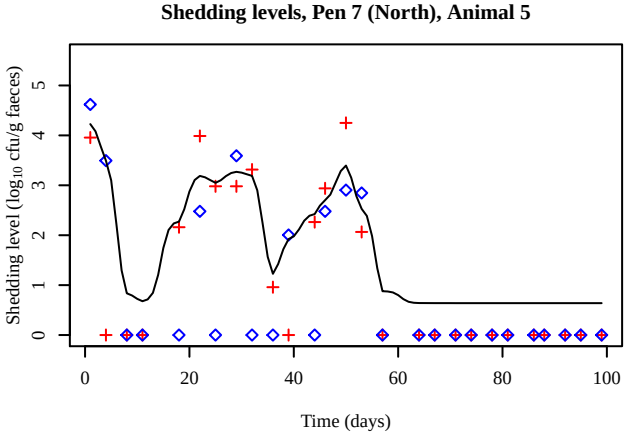
Shedding level (log10 cfu/g faeces)
Time (days)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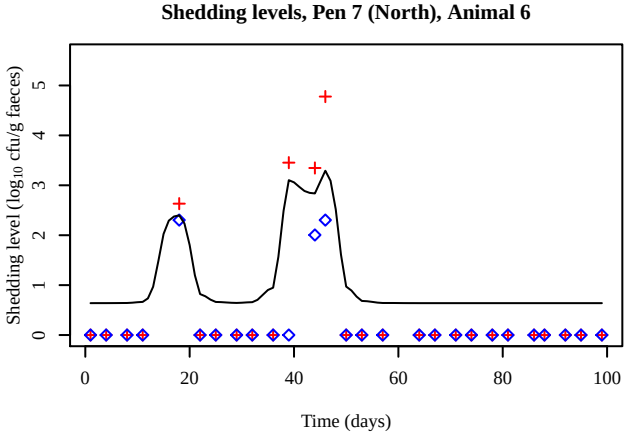
Shedding level (log10 cfu/g faeces)
Time (days)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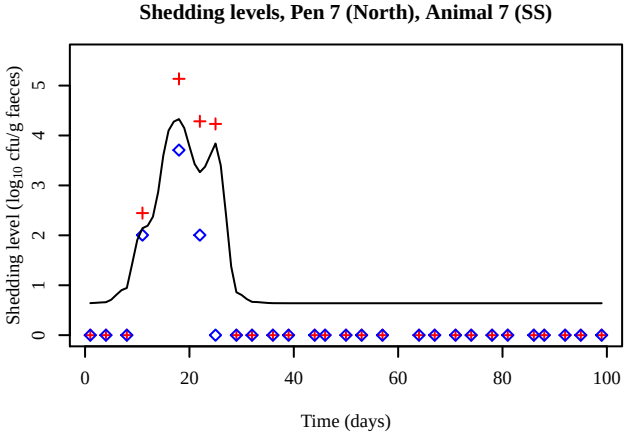
Time (days)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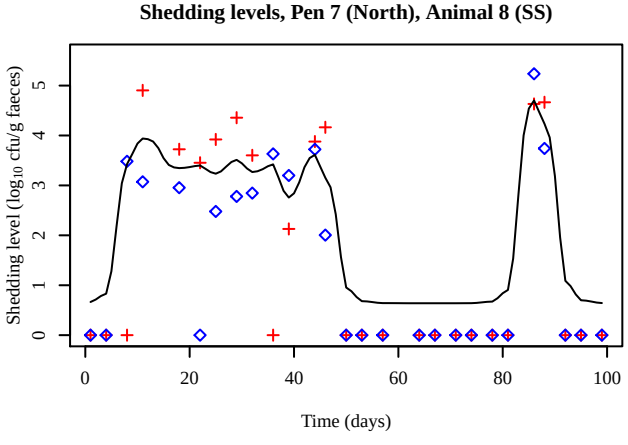
Shedding level (log10 cfu/g faeces)
Time (days)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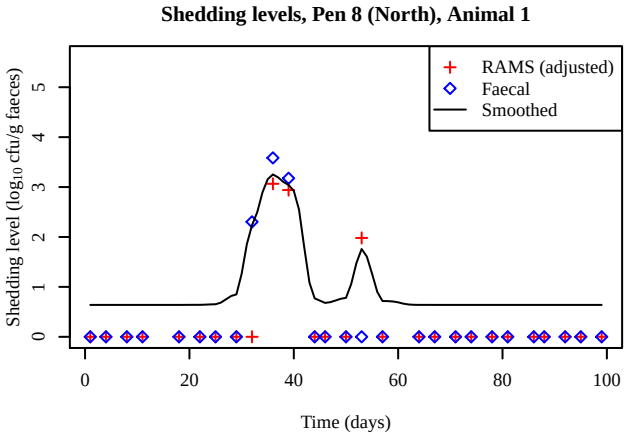
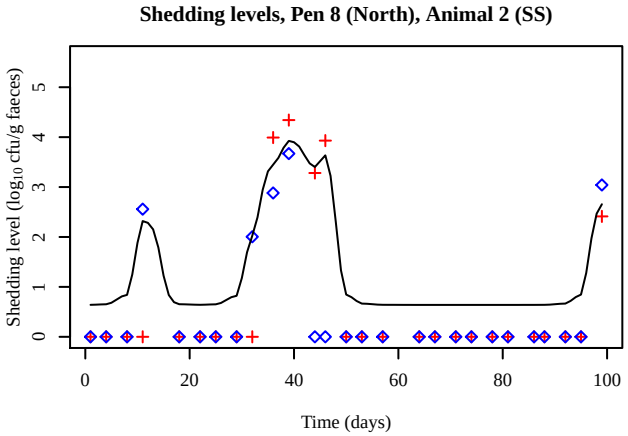
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 8 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)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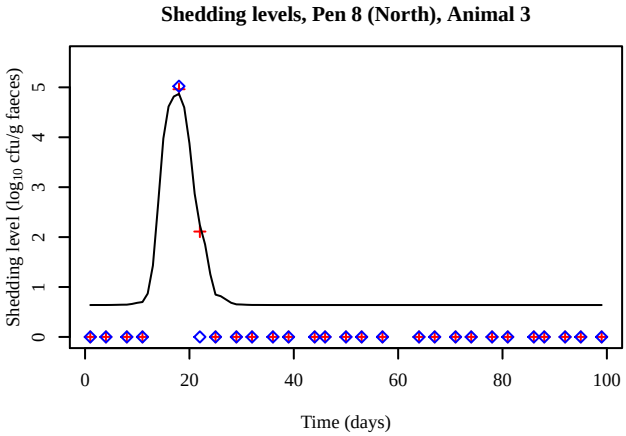
Shedding level (log10 cfu/g faeces)
Time (days)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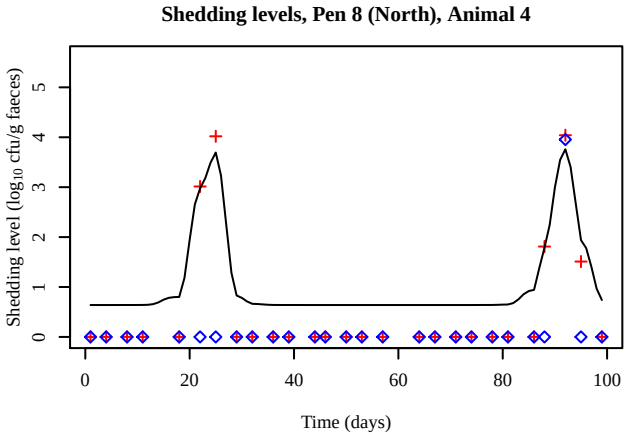
Shedding level (log10 cfu/g faeces)
Time (days)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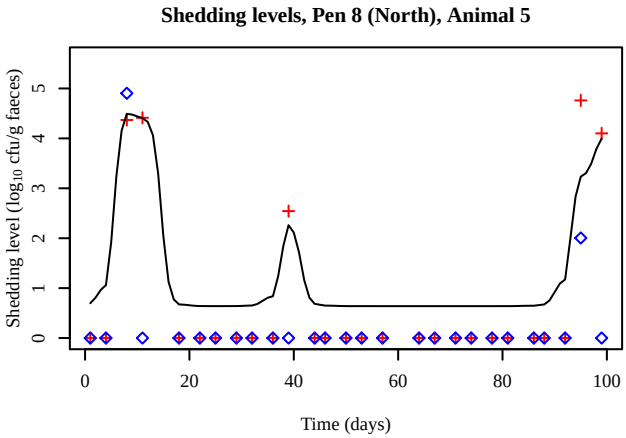
Shedding level (log10 cfu/g faeces)
Time (days)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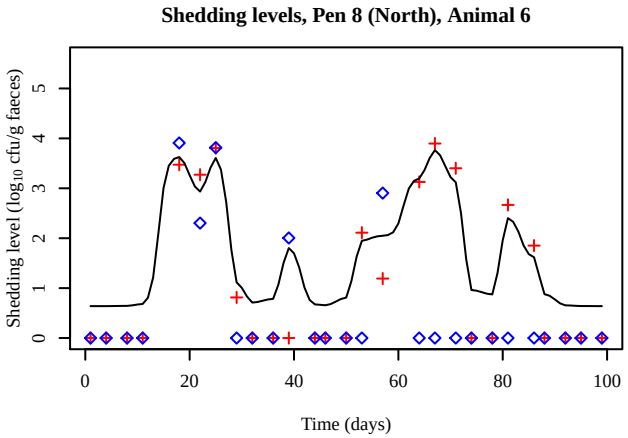
Shedding level (log10 cfu/g faeces)
Time (days)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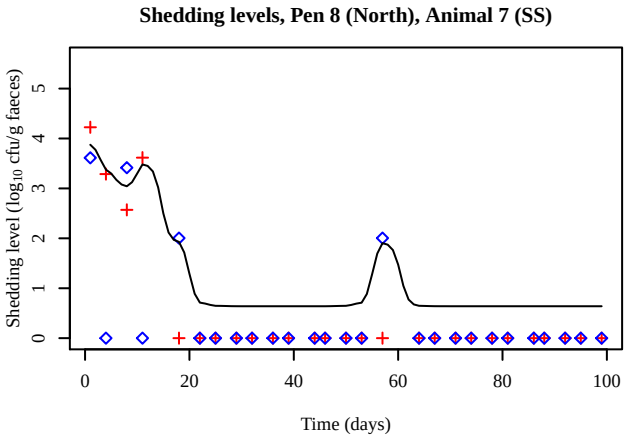
Shedding level (log10 cfu/g faeces)
Time (days)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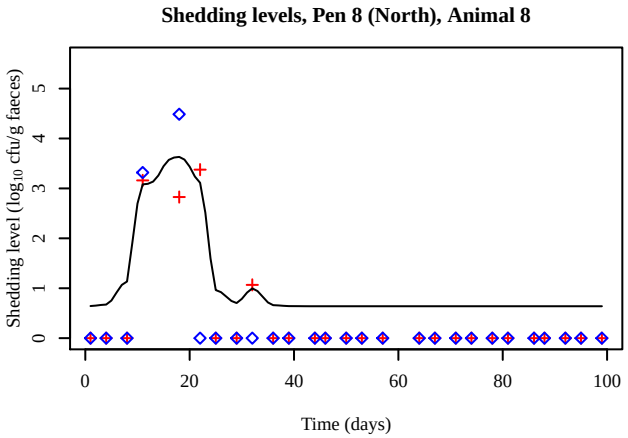
Time (days)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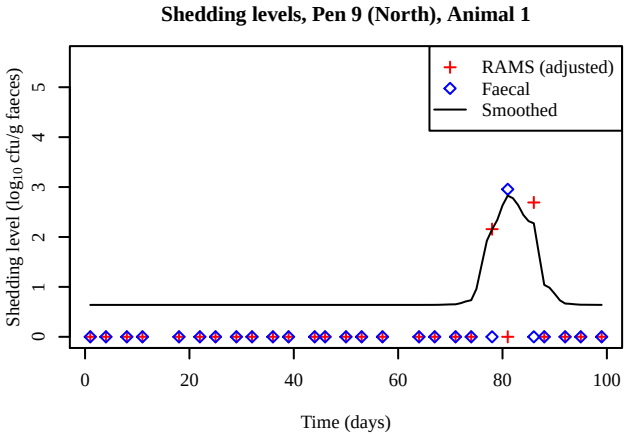
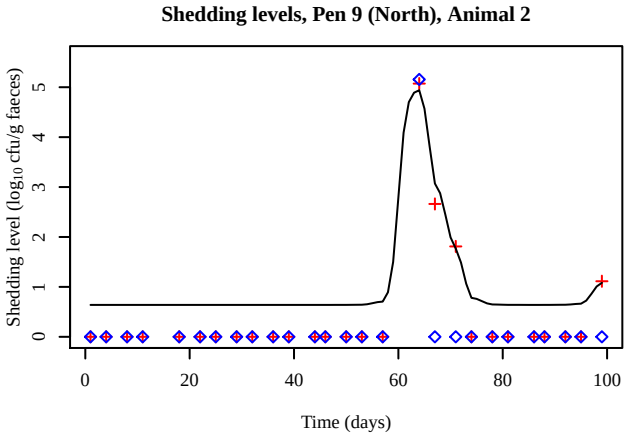
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 9 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)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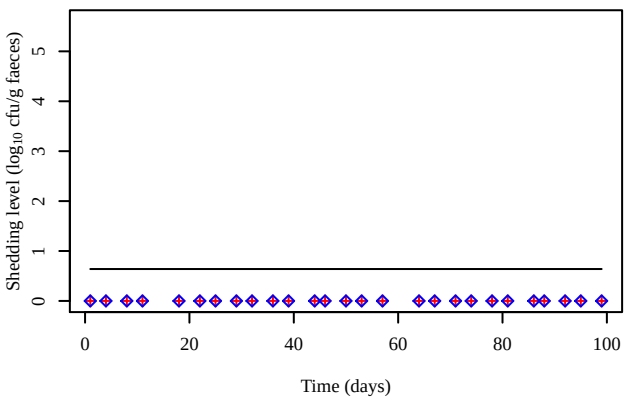
Time (days)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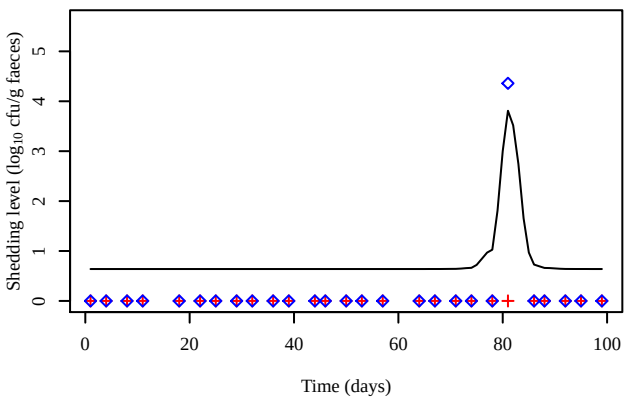
Shedding level (log10 cfu/g faeces)
Time (days)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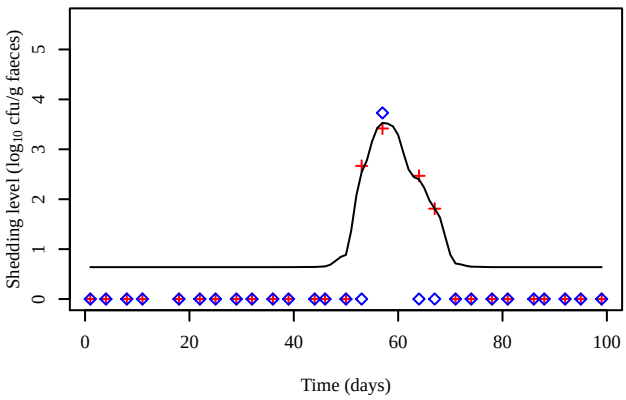
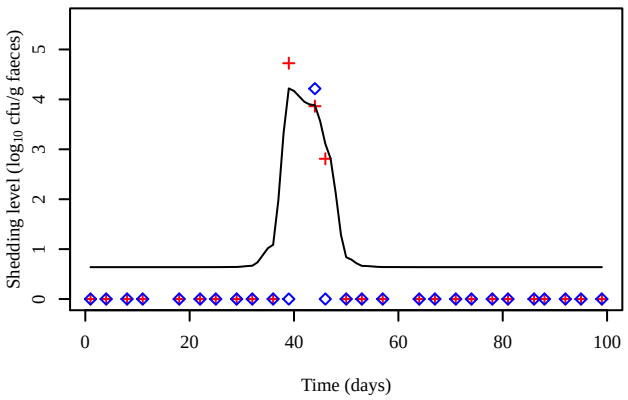
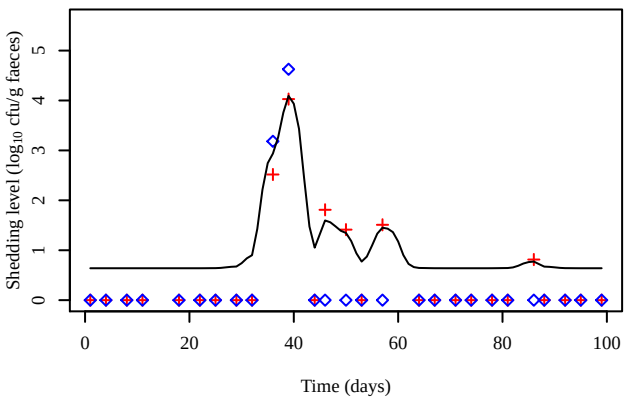
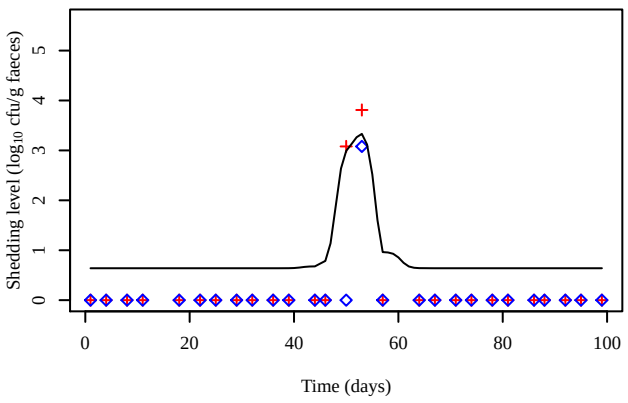
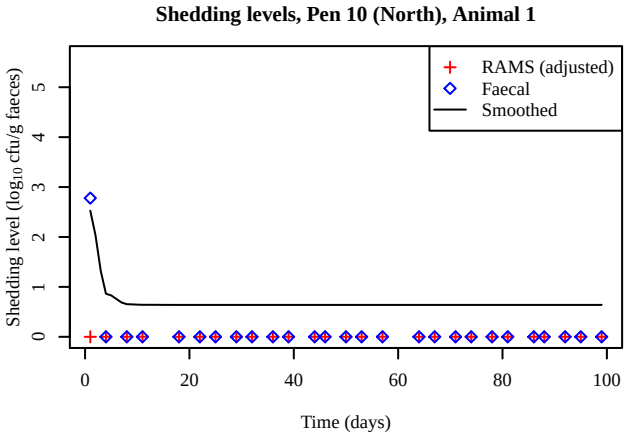
Shedding level (log10 cfu/g faeces)
Time (days)

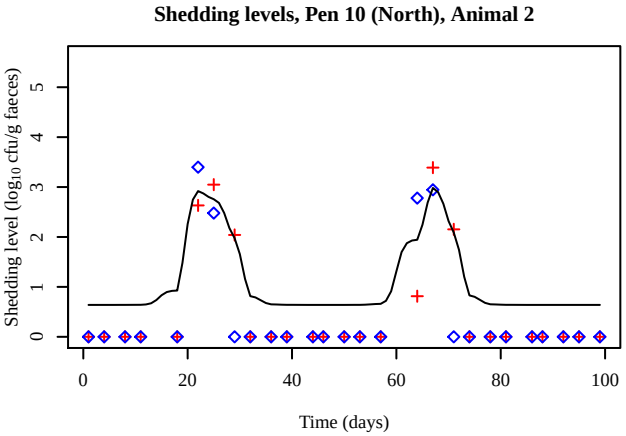

Shedding levels, Pen 9 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

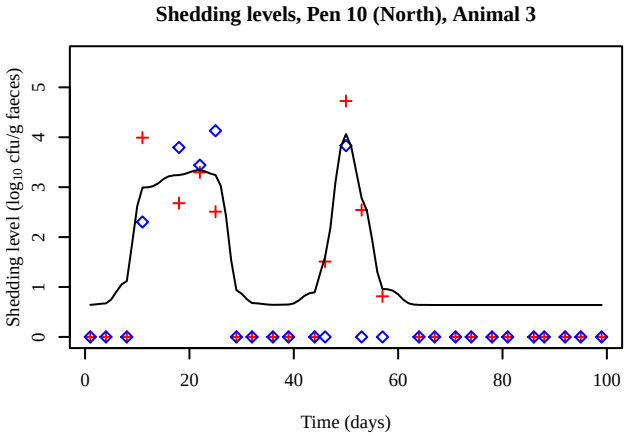

Shedding levels, Pen 9 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

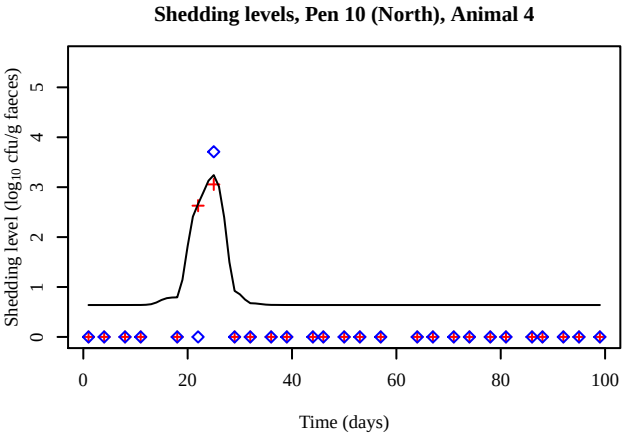

Shedding levels, Pen 9 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

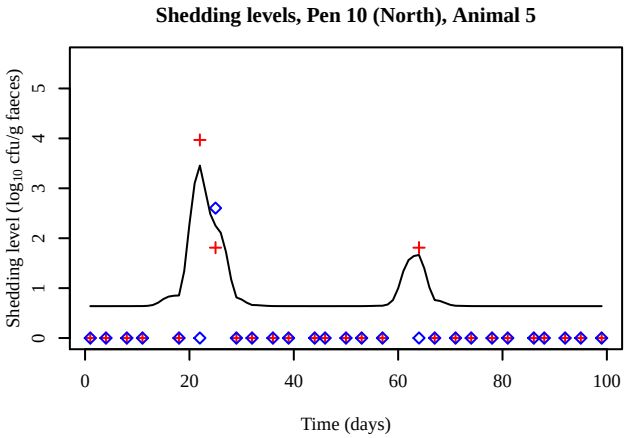

Shedding levels, Pen 9 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

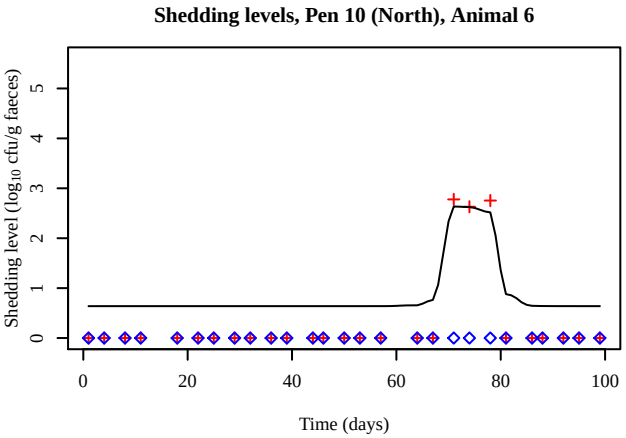

Shedding levels, Pen 10 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

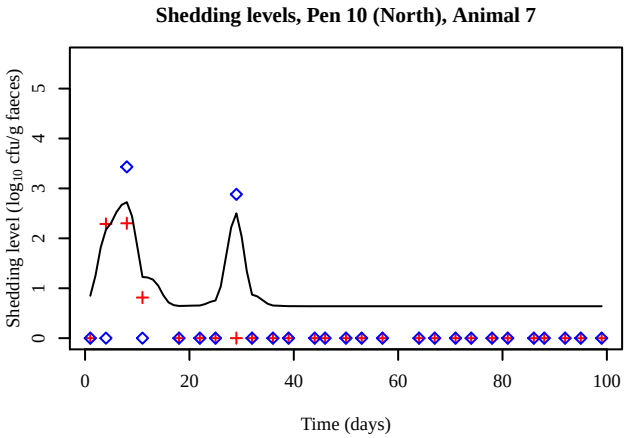

Shedding levels, Pen 10 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

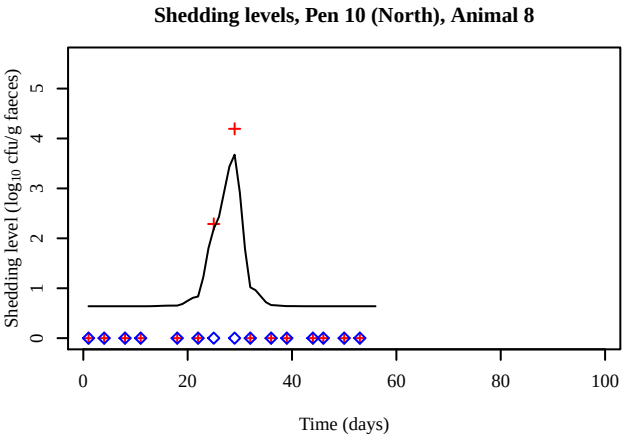

Shedding levels, Pen 10 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

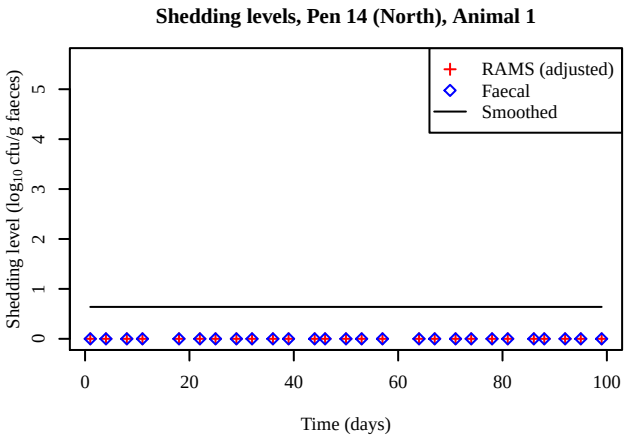

Shedding levels, Pen 10 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

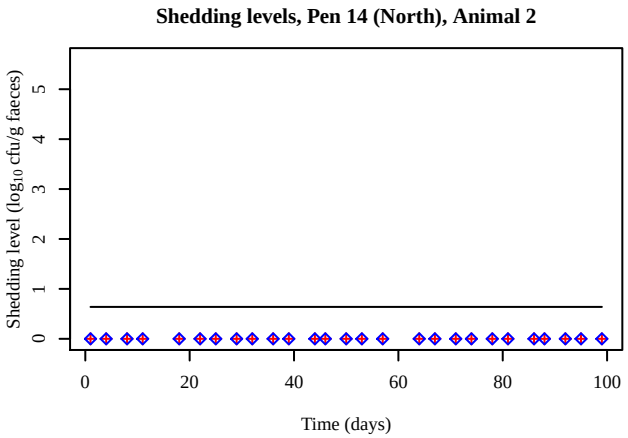

Shedding levels, Pen 10 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

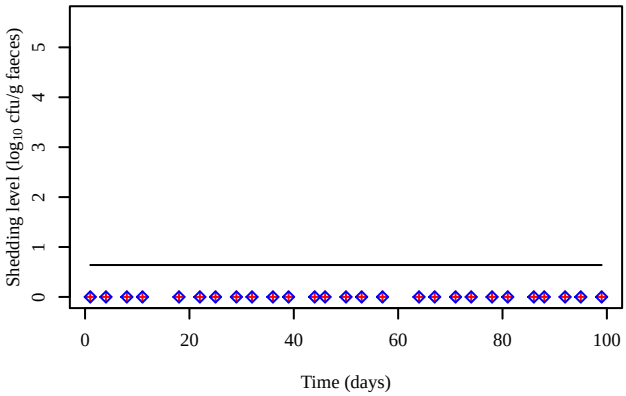

Shedding levels, Pen 10 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

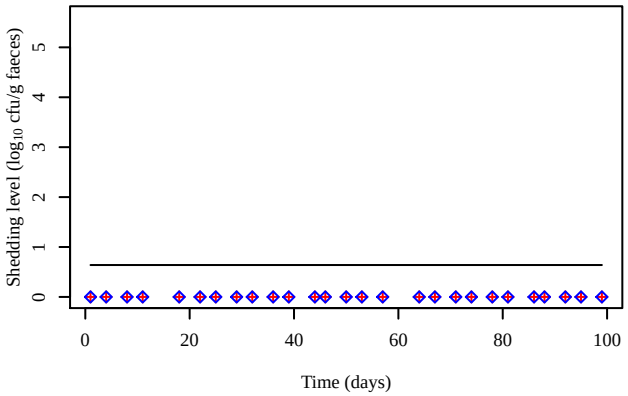

Shedding levels, Pen 10 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

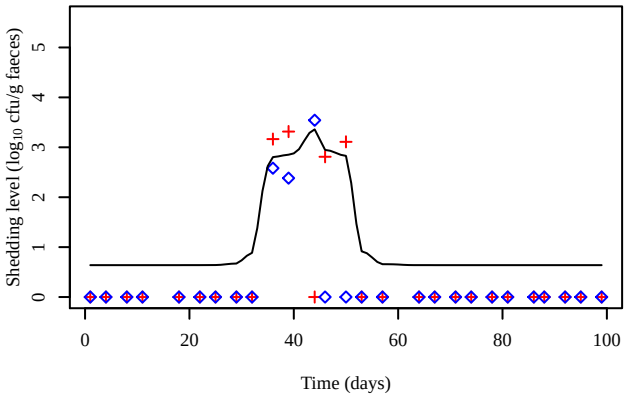

Shedding levels, Pen 10 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

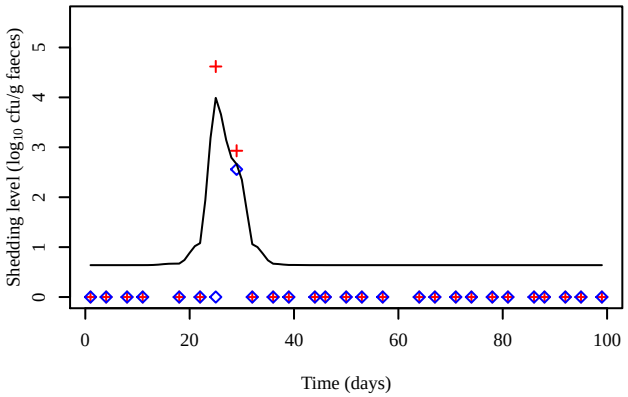

Shedding levels, Pen 14 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

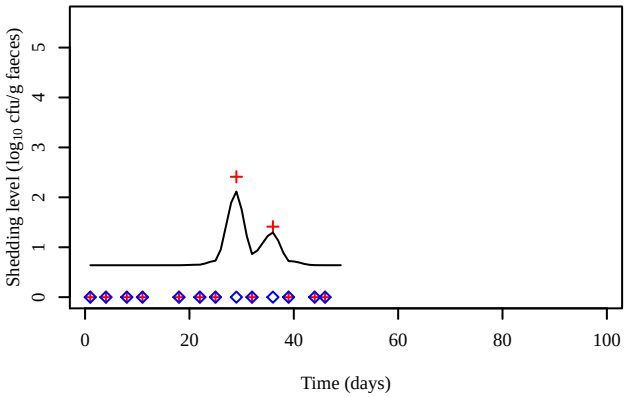

Shedding levels, Pen 14 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

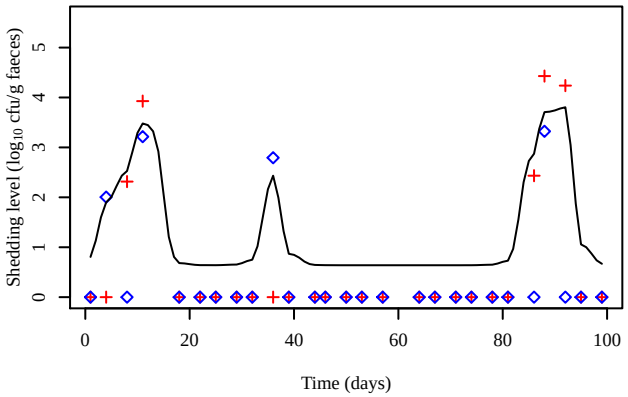

Shedding levels, Pen 14 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

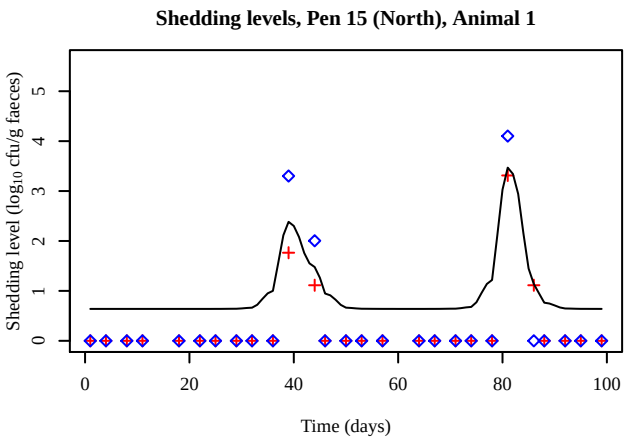

Shedding levels, Pen 14 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

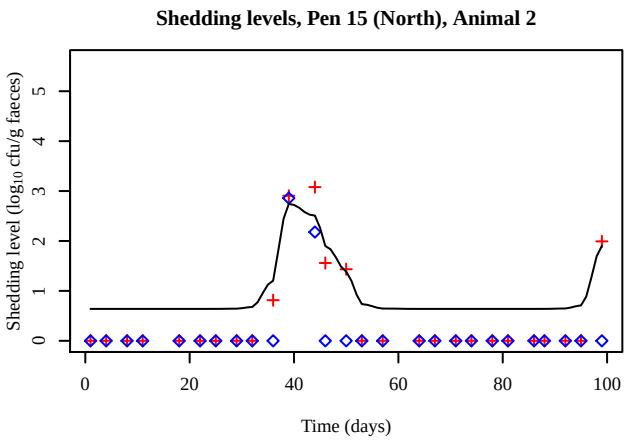

Shedding levels, Pen 14 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

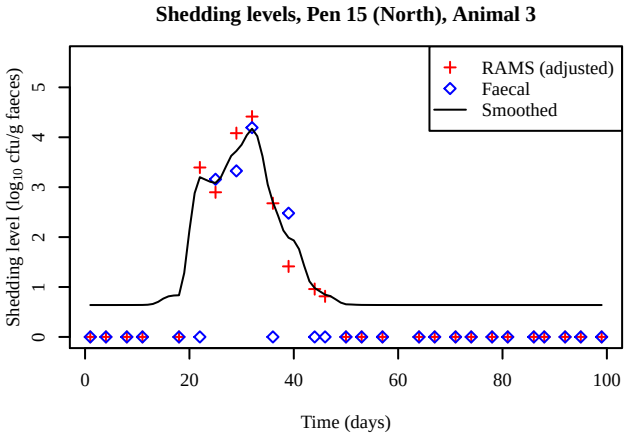

Shedding levels, Pen 14 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

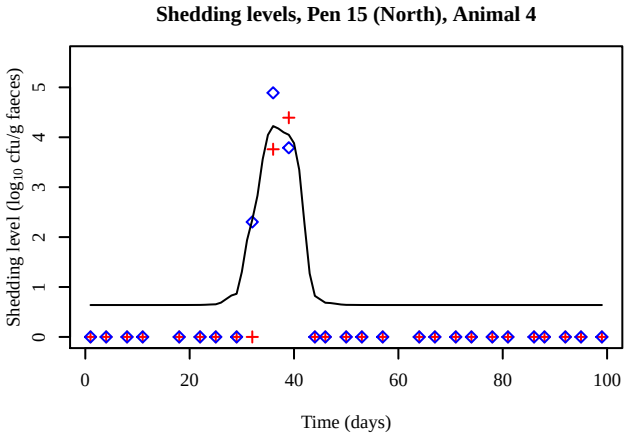

Shedding levels, Pen 14 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

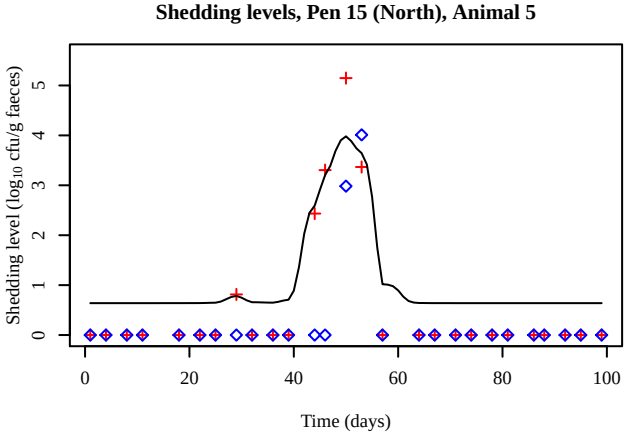

Shedding levels, Pen 14 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

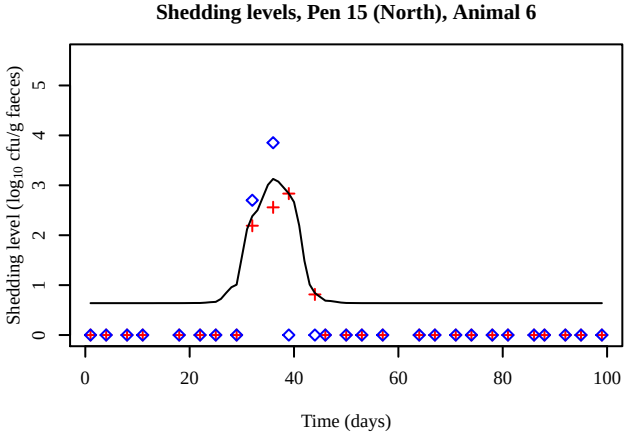

Shedding levels, Pen 15 (North), Animal 1
Shedding level (log10 cfu/g faeces)
Time (days)

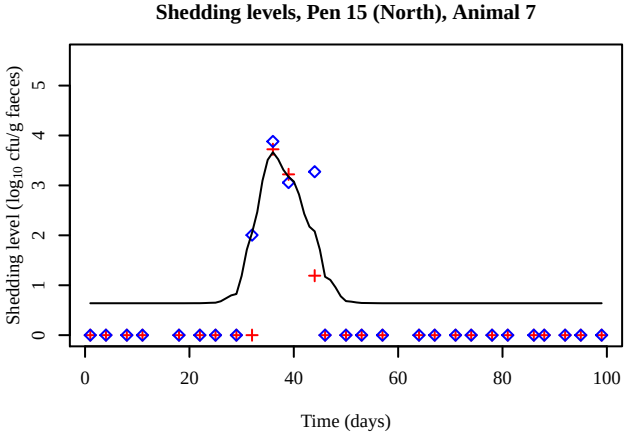

Shedding levels, Pen 15 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

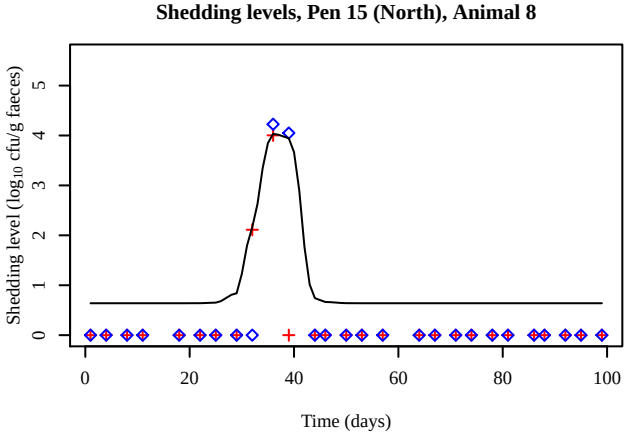

Shedding levels, Pen 15 (North), Animal 3
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

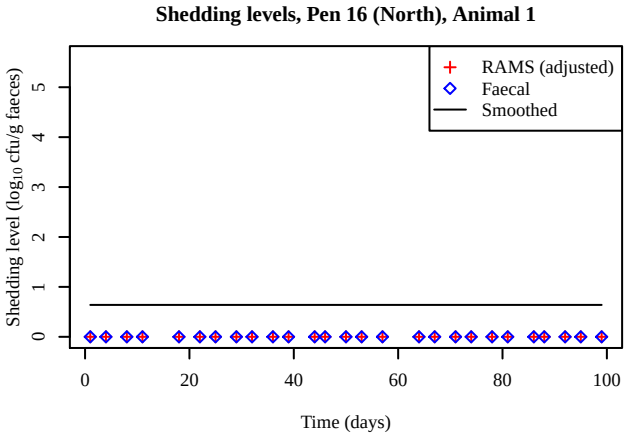

Shedding levels, Pen 15 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

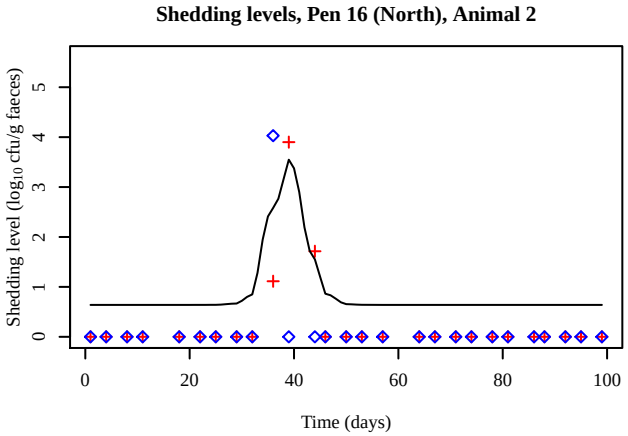

Shedding levels, Pen 15 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

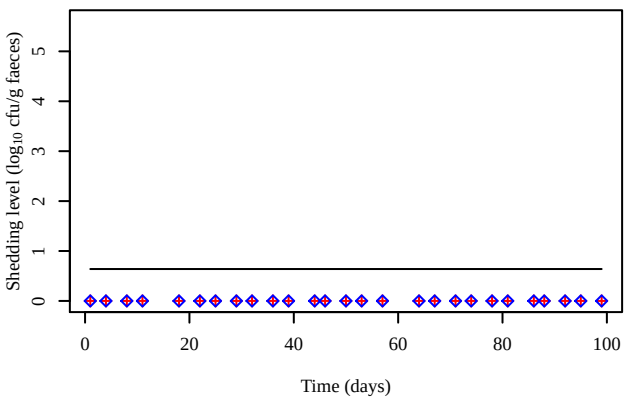

Shedding levels, Pen 15 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

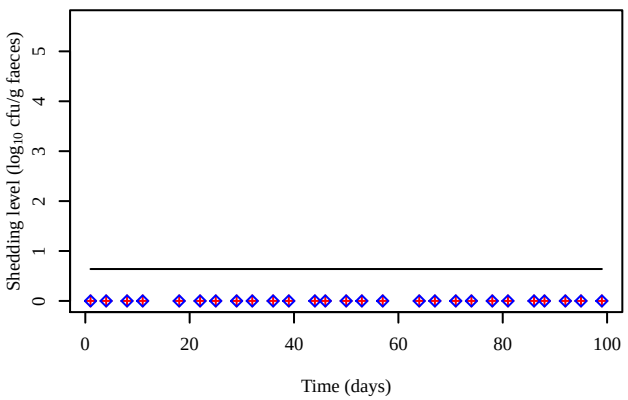

Shedding levels, Pen 15 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

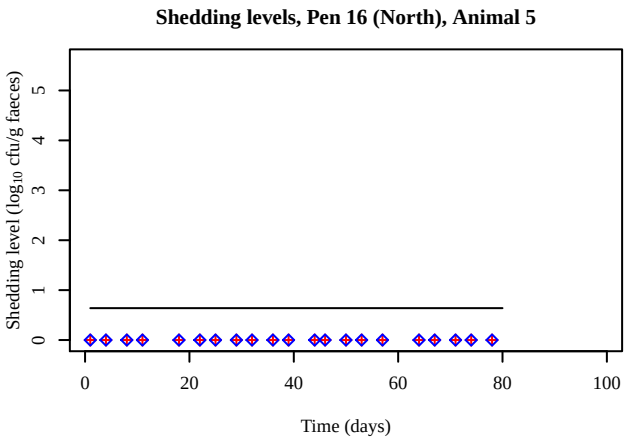

Shedding levels, Pen 15 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

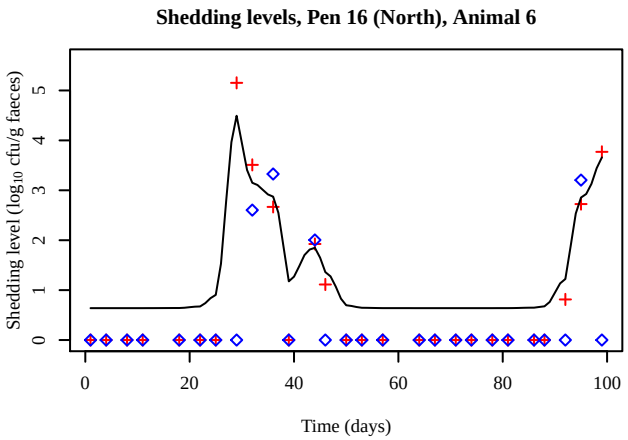

Shedding levels, Pen 16 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

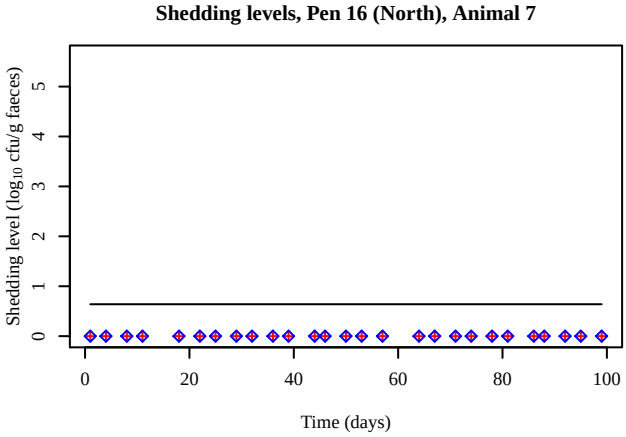

Shedding levels, Pen 16 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

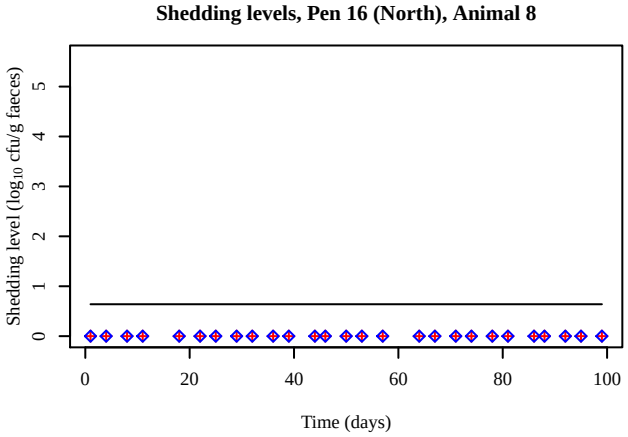

Shedding levels, Pen 16 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

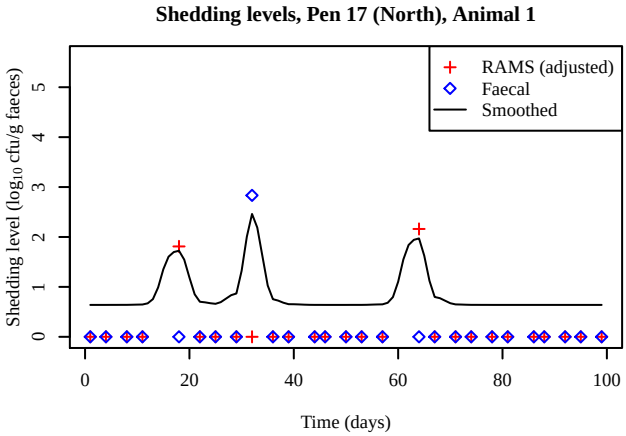

Shedding levels, Pen 16 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

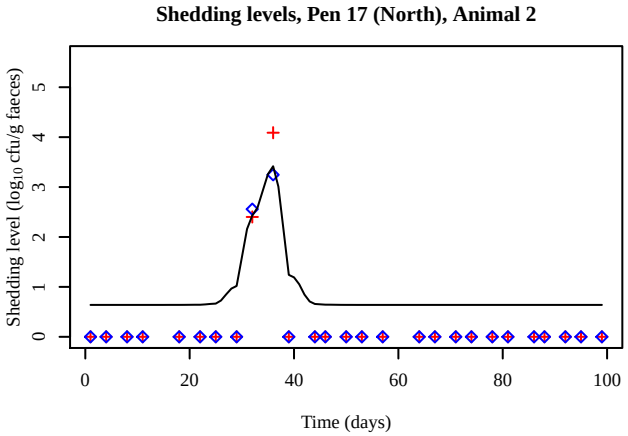

Shedding levels, Pen 16 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

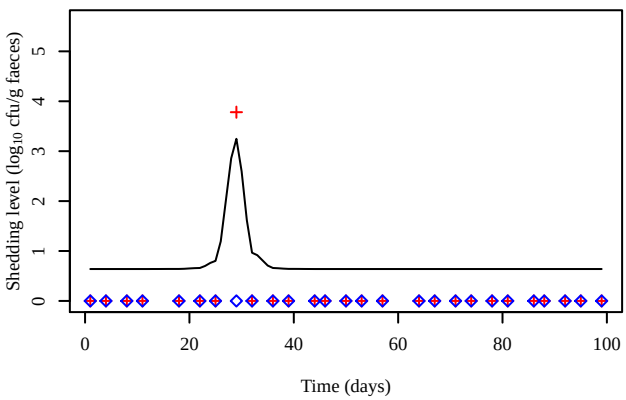

Shedding levels, Pen 16 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

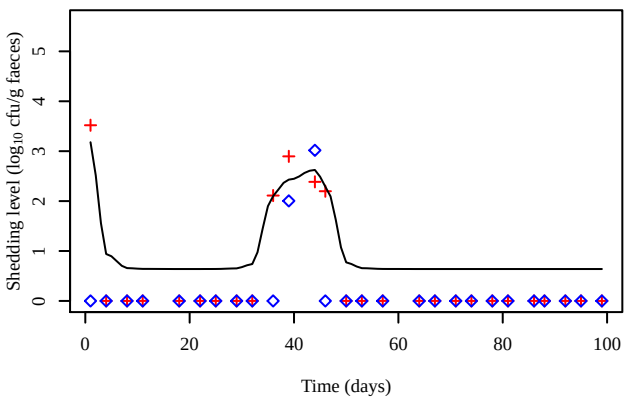

Shedding levels, Pen 16 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

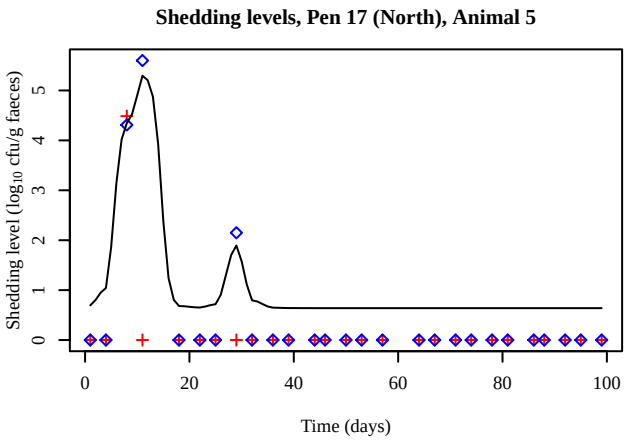

Shedding levels, Pen 16 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

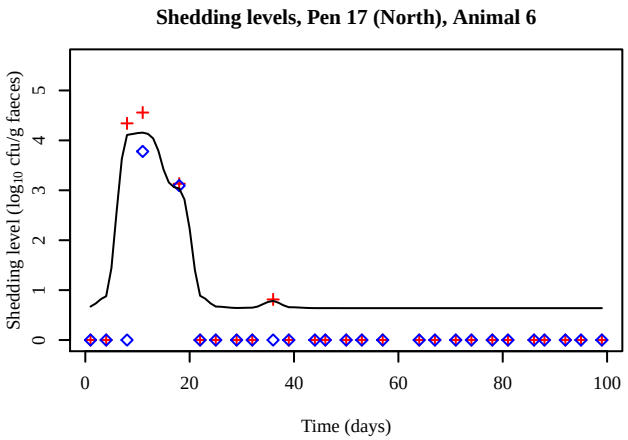

Shedding levels, Pen 17 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

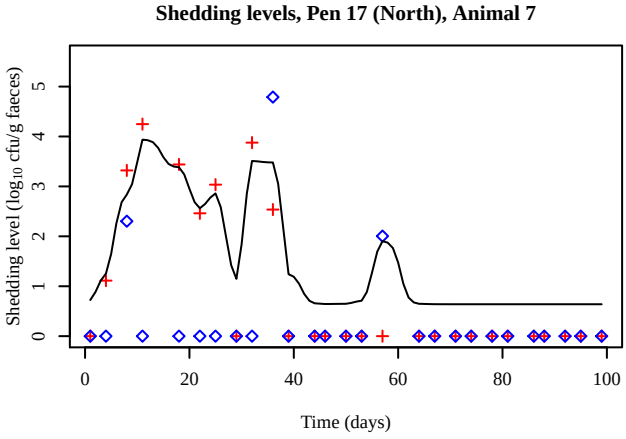

Shedding levels, Pen 17 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

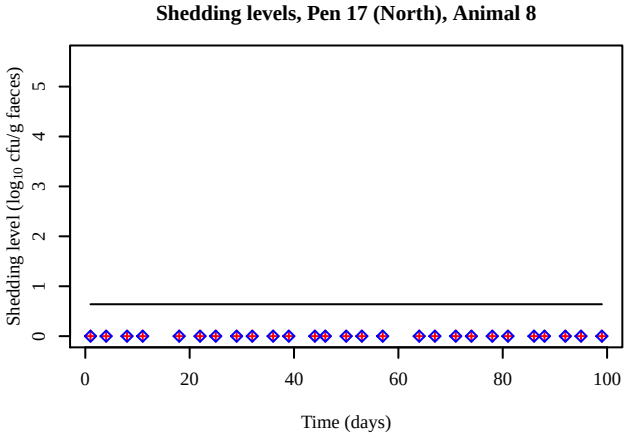

Shedding levels, Pen 17 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

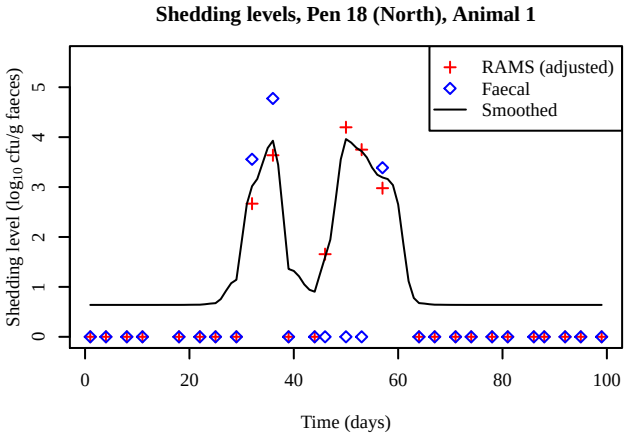

Shedding levels, Pen 17 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

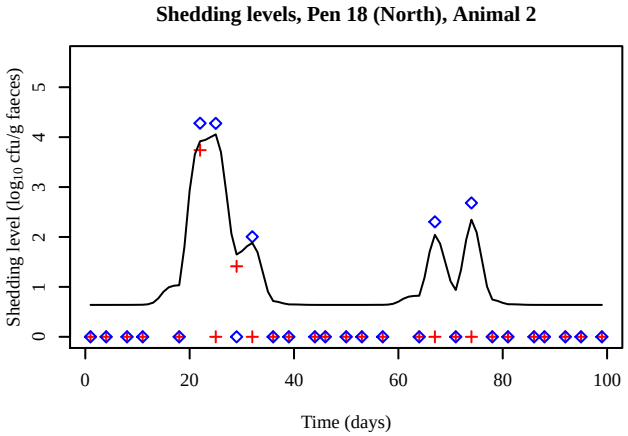

Shedding levels, Pen 17 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

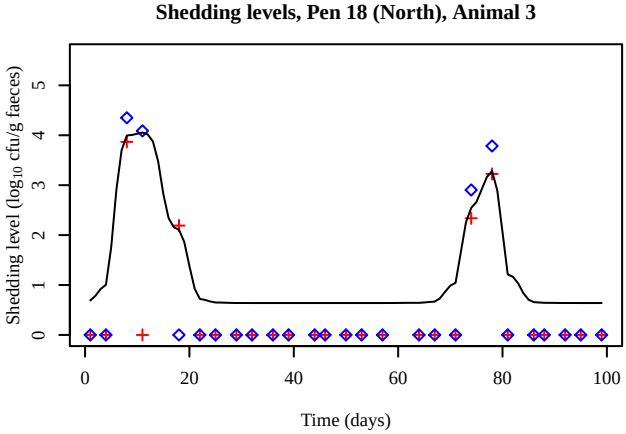

Shedding levels, Pen 17 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

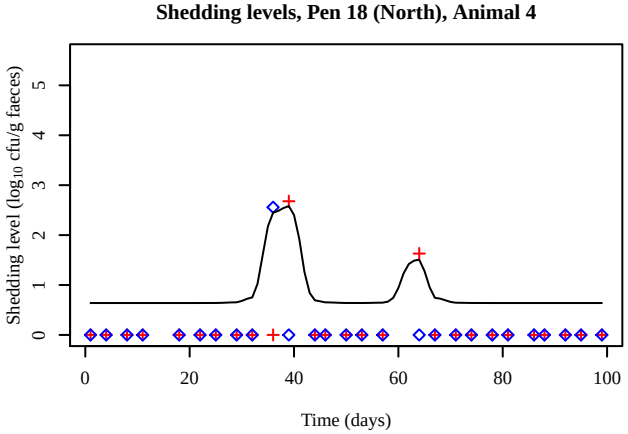

Shedding levels, Pen 17 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

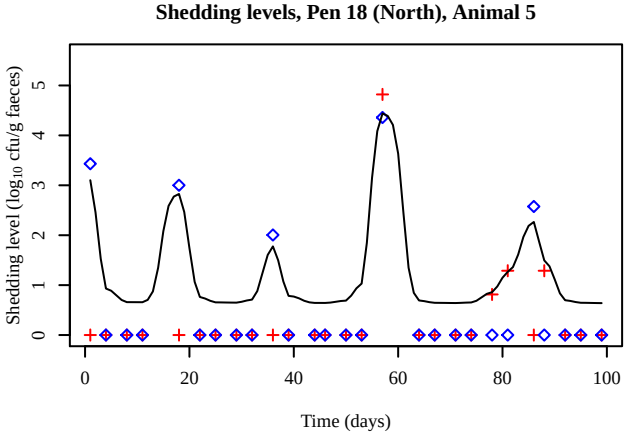

Shedding levels, Pen 17 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

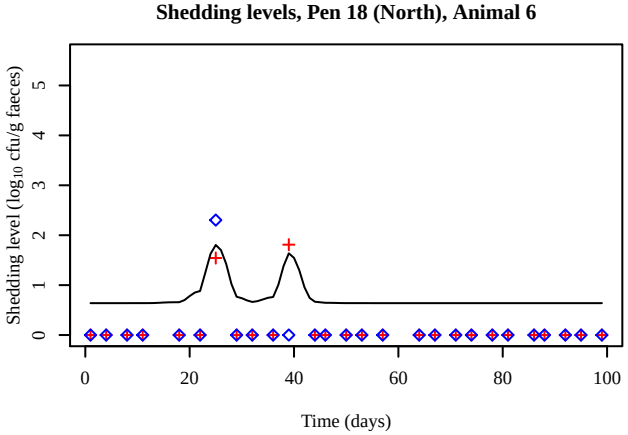

Shedding levels, Pen 18 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

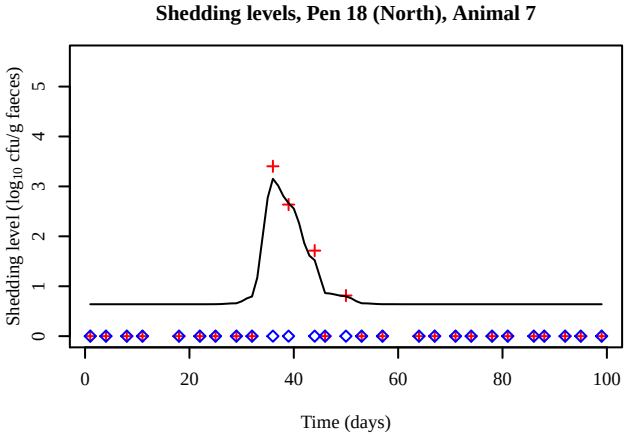

Shedding levels, Pen 18 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

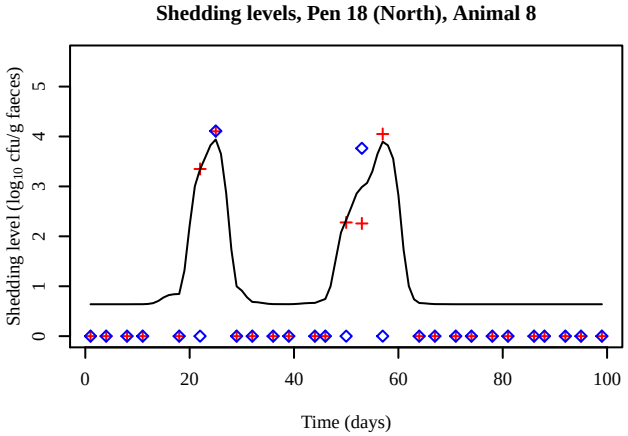

Shedding levels, Pen 18 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

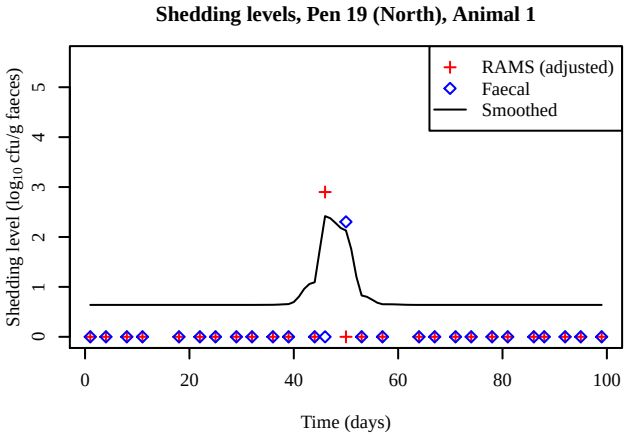

Shedding levels, Pen 18 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

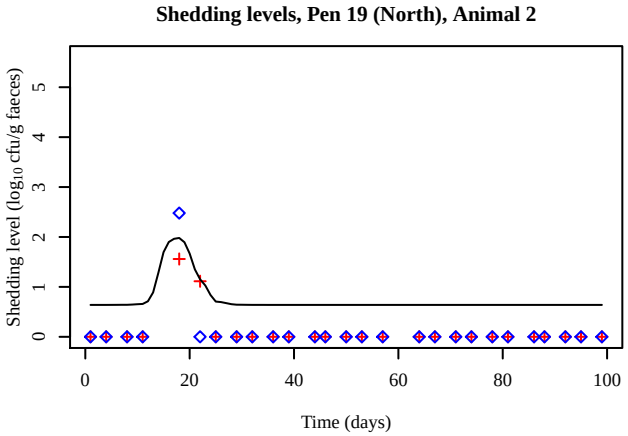

Shedding levels, Pen 18 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

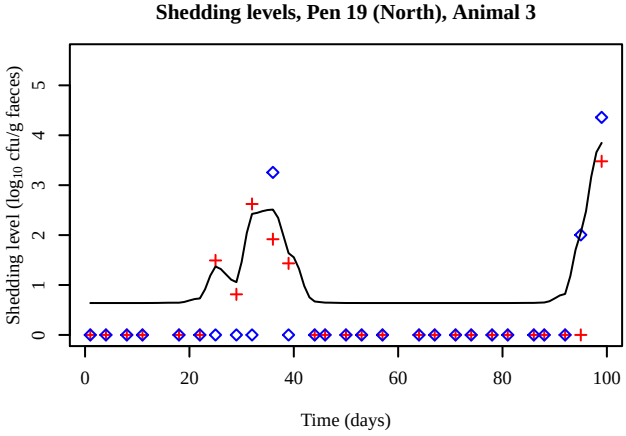

Shedding levels, Pen 18 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

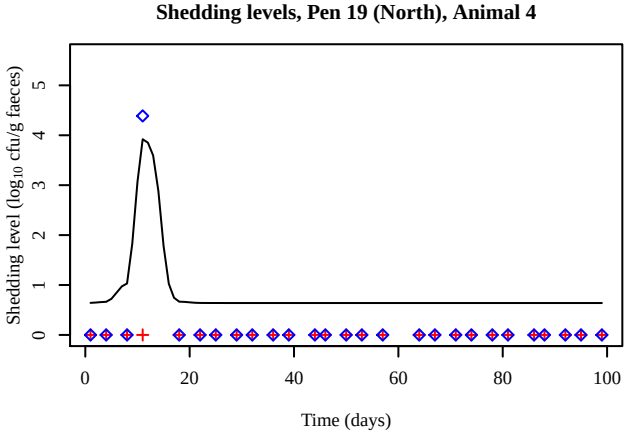

Shedding levels, Pen 18 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

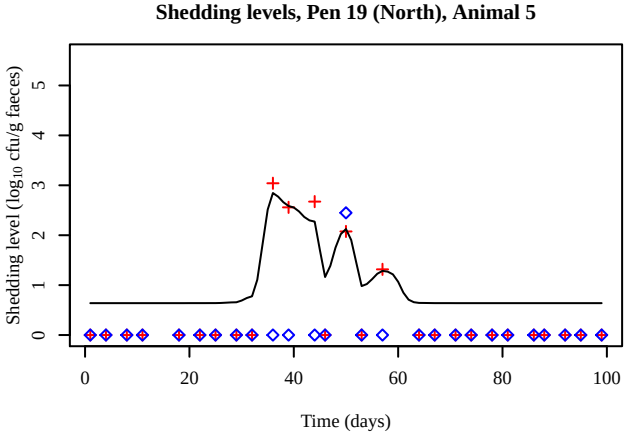

Shedding levels, Pen 18 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

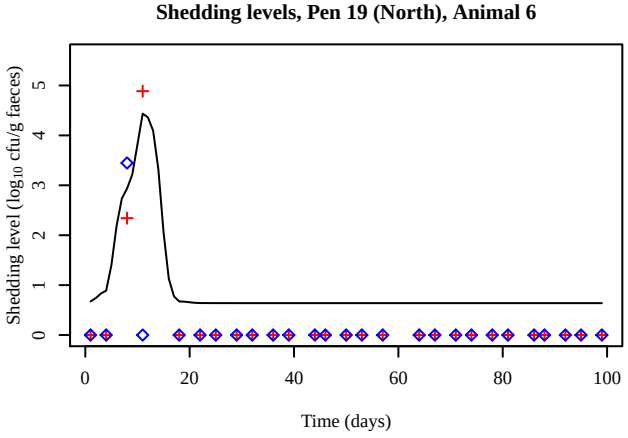

Shedding levels, Pen 19 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

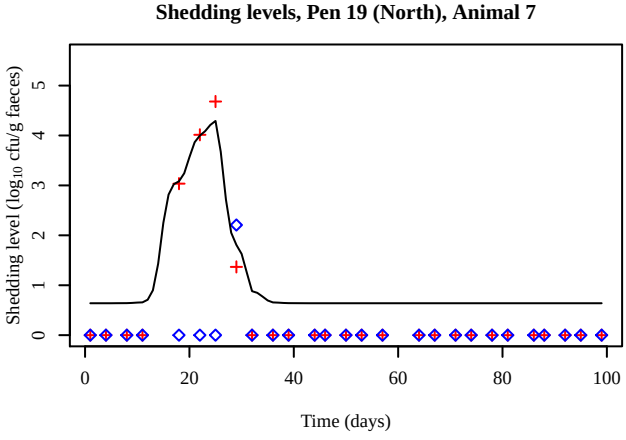

Shedding levels, Pen 19 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

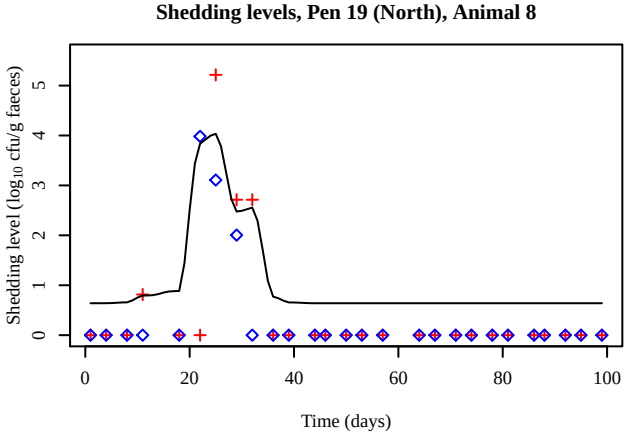

Shedding levels, Pen 19 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

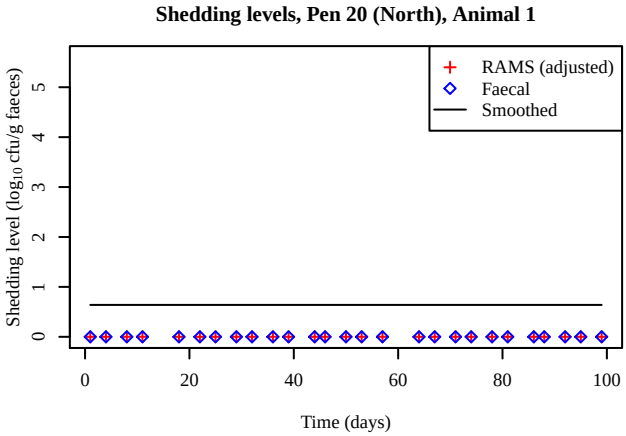

Shedding levels, Pen 19 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

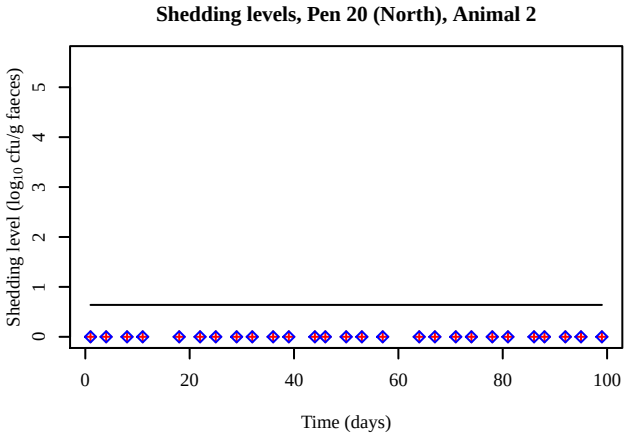

Shedding levels, Pen 19 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

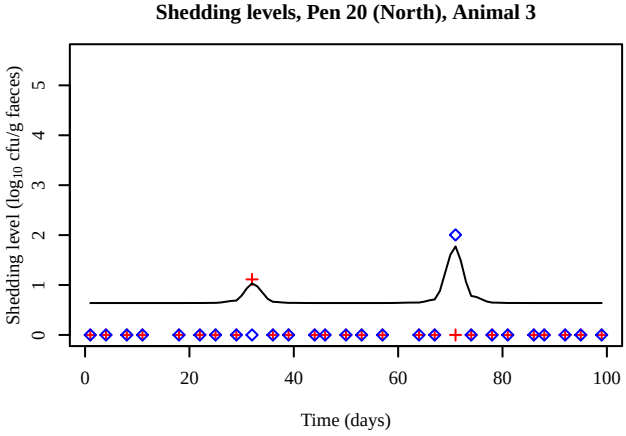

Shedding levels, Pen 19 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

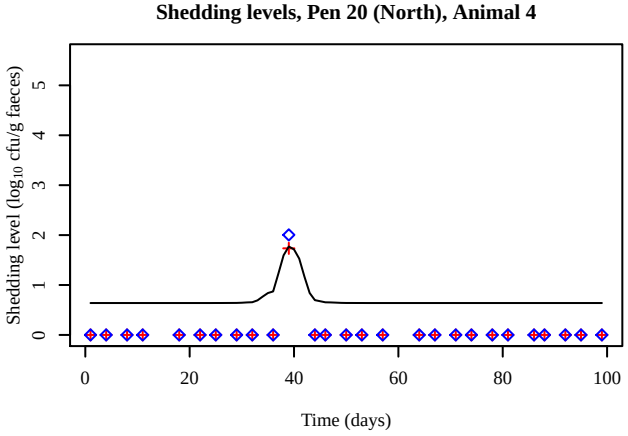

Shedding levels, Pen 19 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

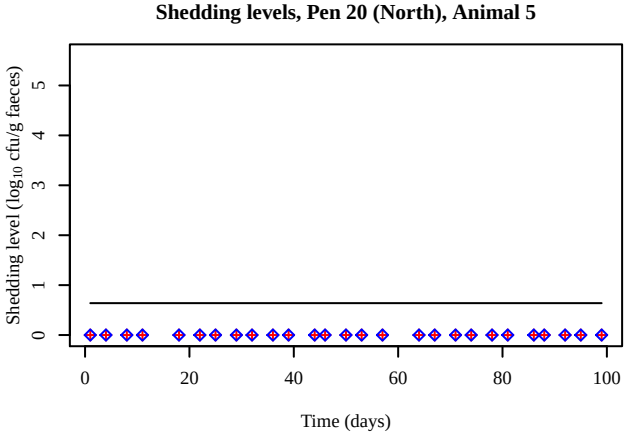

Shedding levels, Pen 19 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

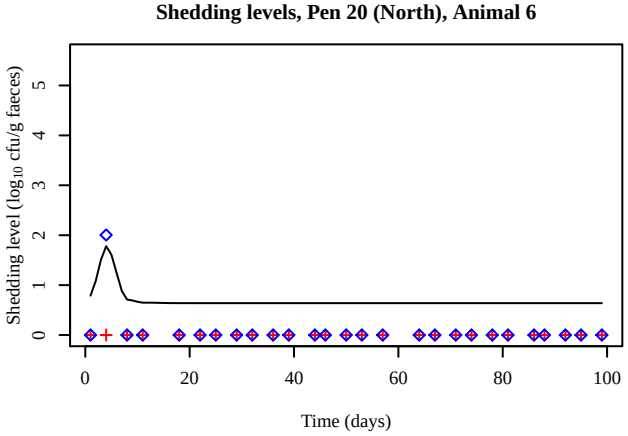

Shedding levels, Pen 20 (North), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

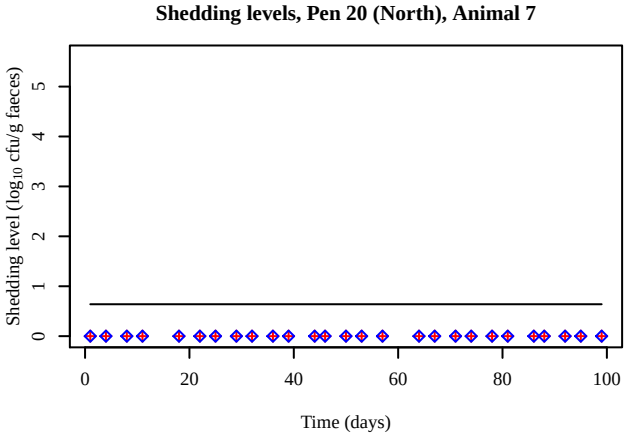

Shedding levels, Pen 20 (North), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

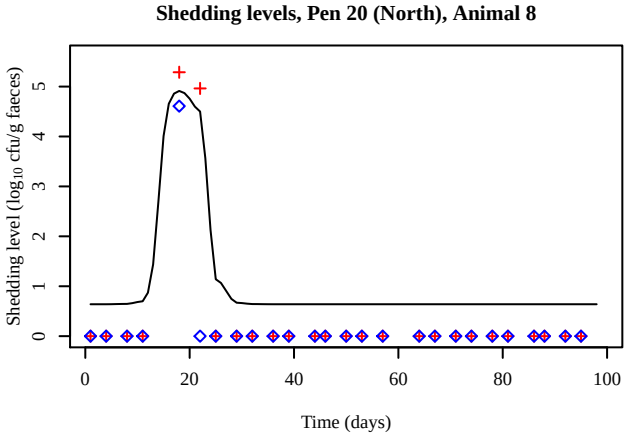

Shedding levels, Pen 20 (North), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

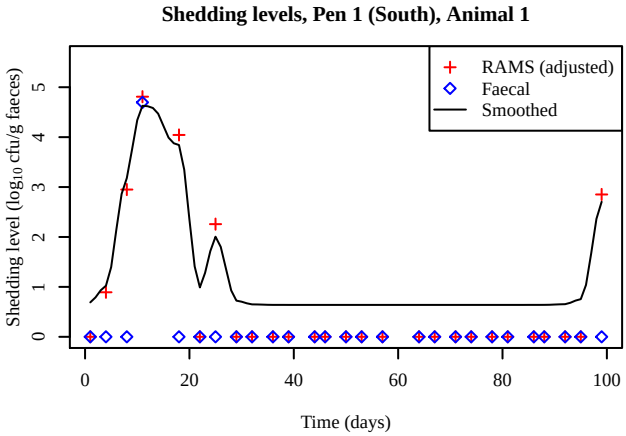

Shedding levels, Pen 20 (North), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

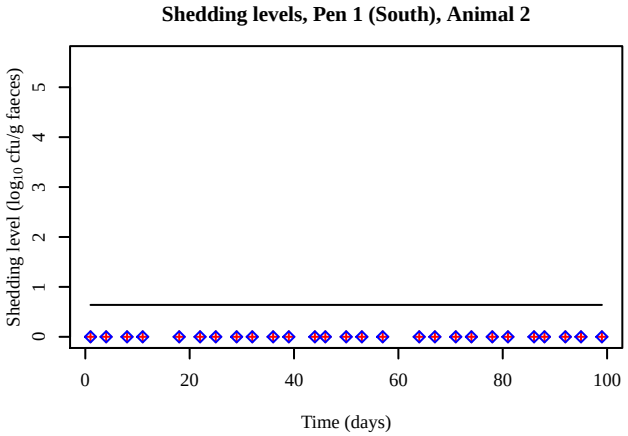

Shedding levels, Pen 20 (North), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

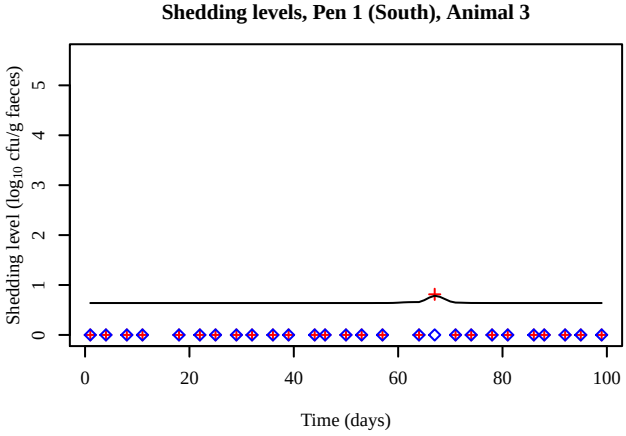

Shedding levels, Pen 20 (North), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

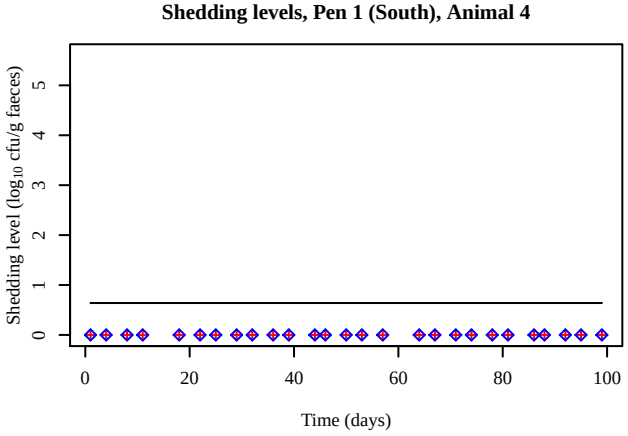

Shedding levels, Pen 20 (North), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

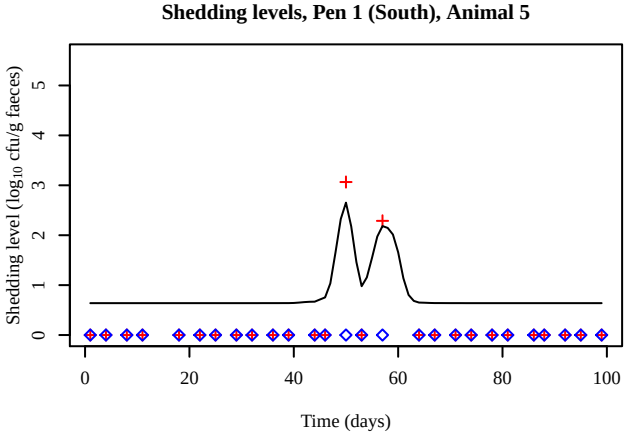

Shedding levels, Pen 20 (North), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

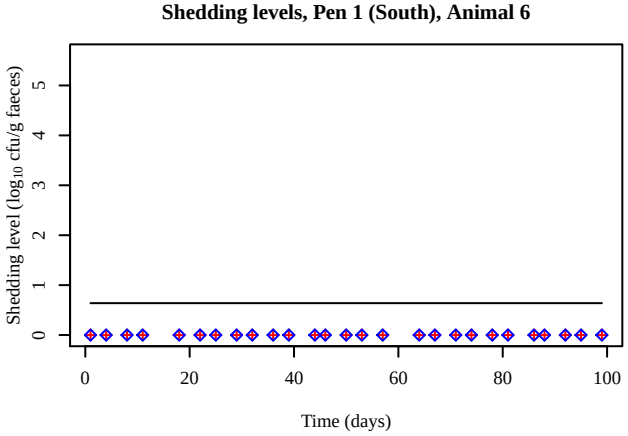

Shedding levels, Pen 1 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

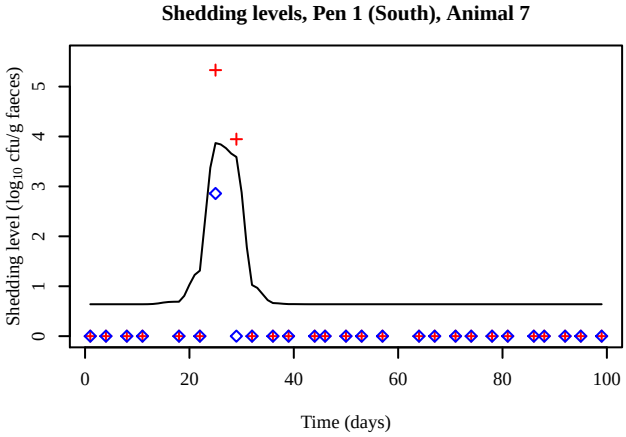

Shedding levels, Pen 1 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

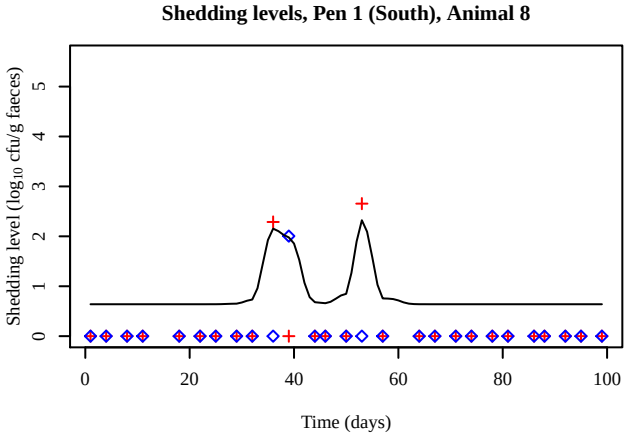

Shedding levels, Pen 1 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

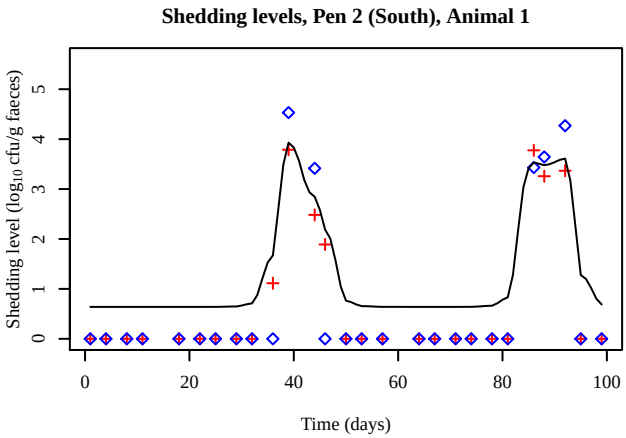

Shedding levels, Pen 1 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

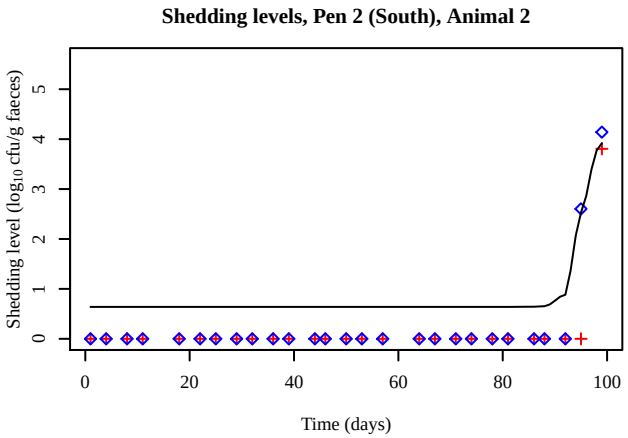

Shedding levels, Pen 1 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

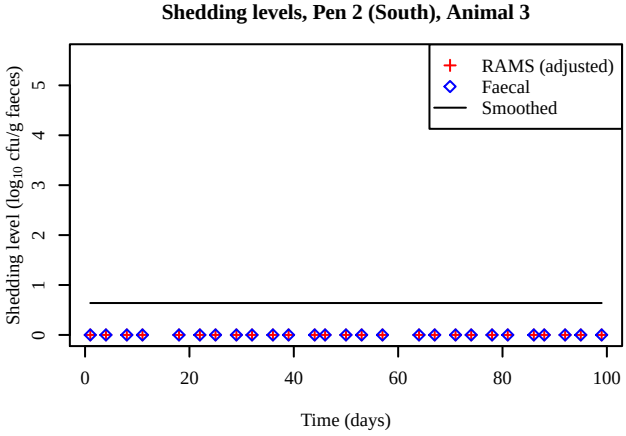

Shedding levels, Pen 1 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

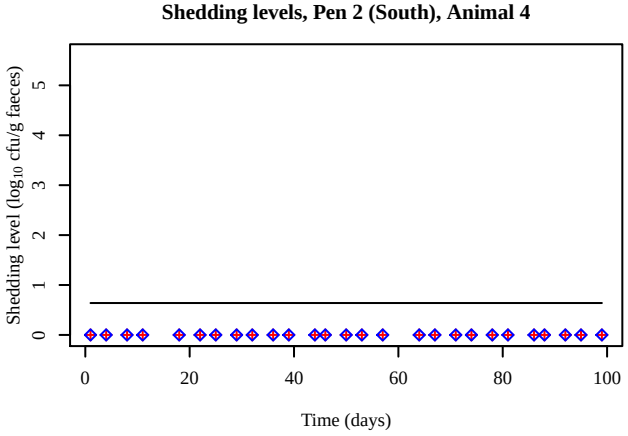

Shedding levels, Pen 1 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

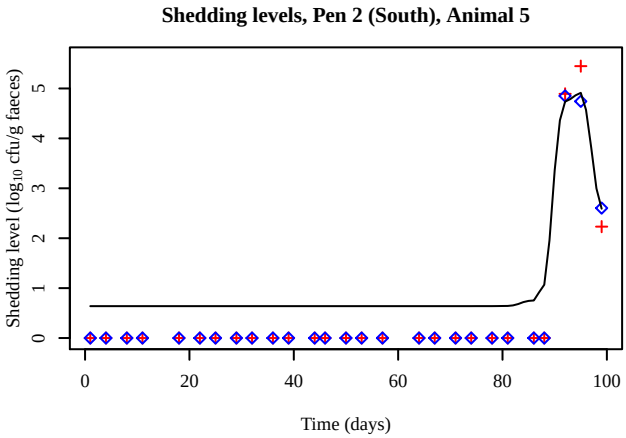

Shedding levels, Pen 1 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

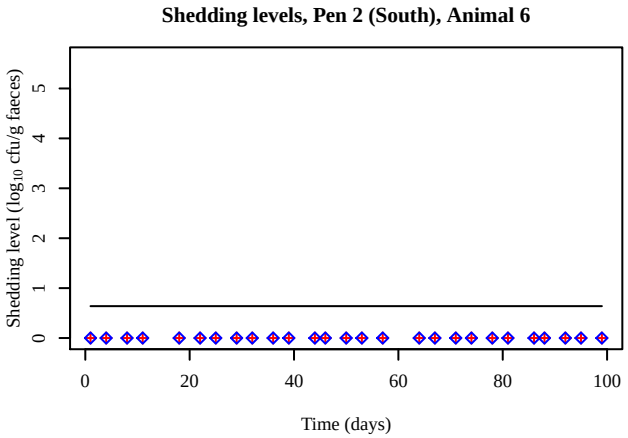

Shedding levels, Pen 2 (South), Animal 1
Shedding level (log10 cfu/g faeces)
Time (days)

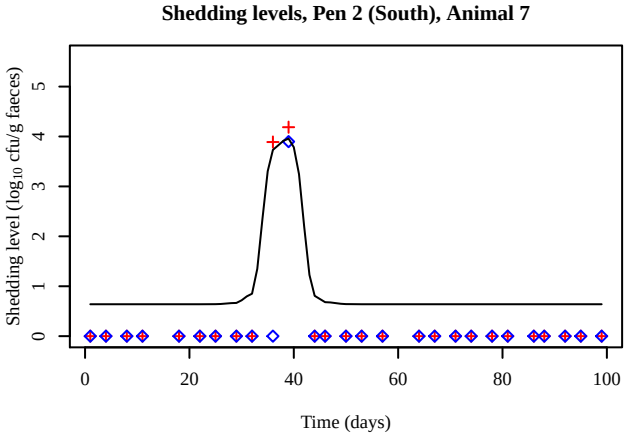

Shedding levels, Pen 2 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

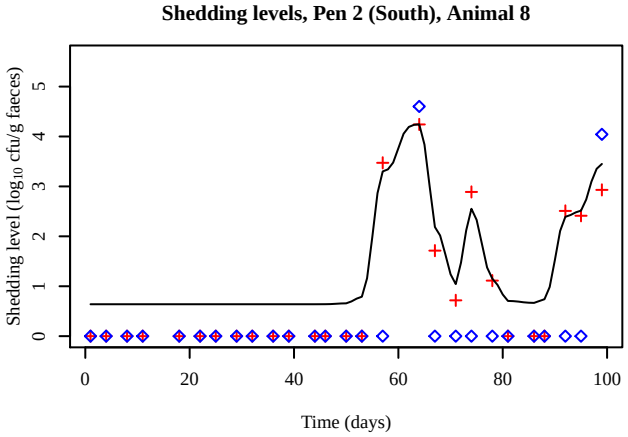

Shedding levels, Pen 2 (South), Animal 3
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

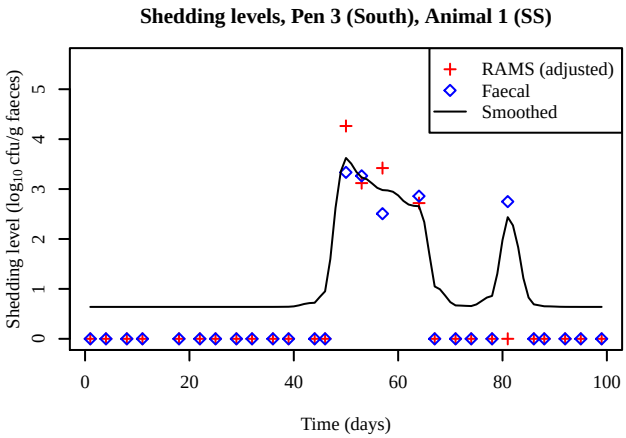

Shedding levels, Pen 2 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

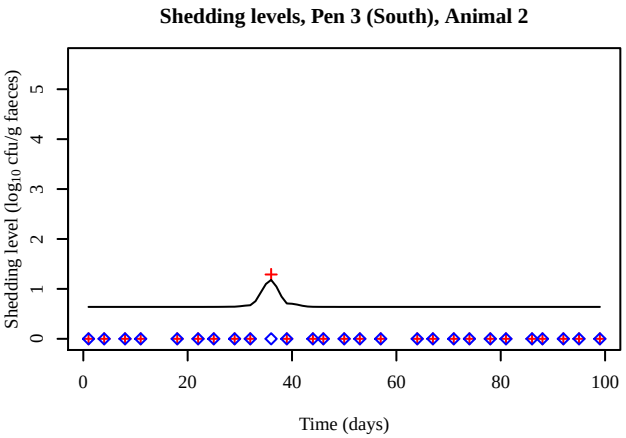

Shedding levels, Pen 2 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

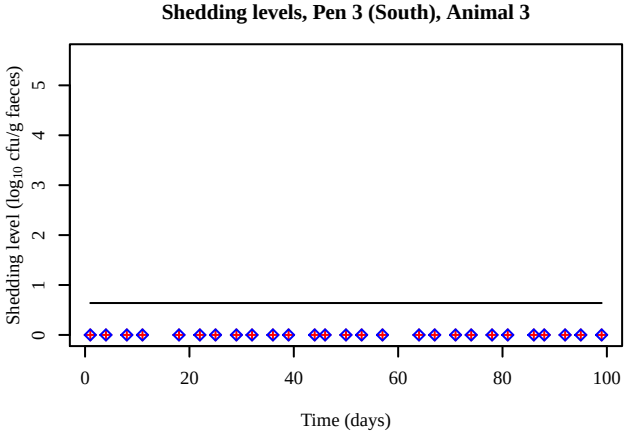

Shedding levels, Pen 2 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

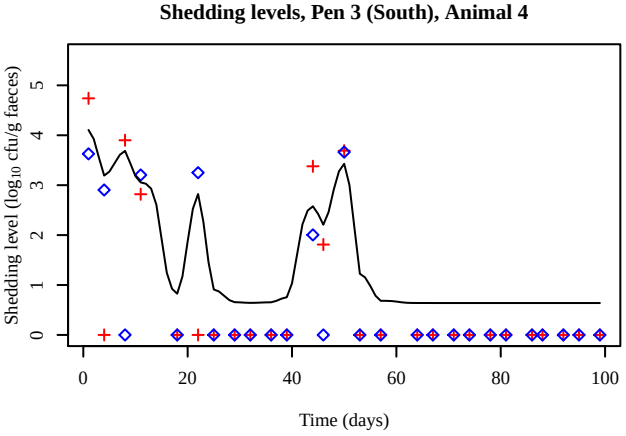

Shedding levels, Pen 2 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

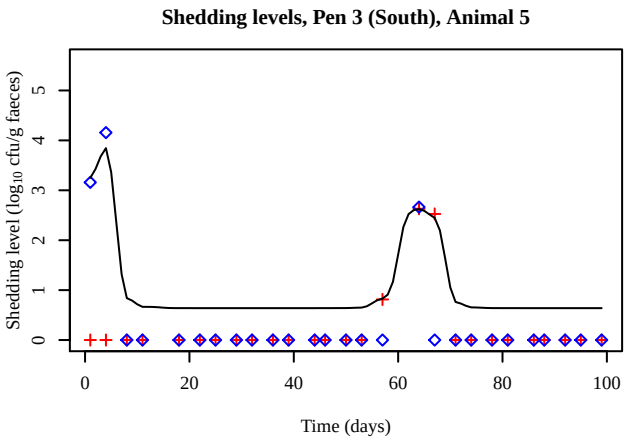

Shedding levels, Pen 2 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

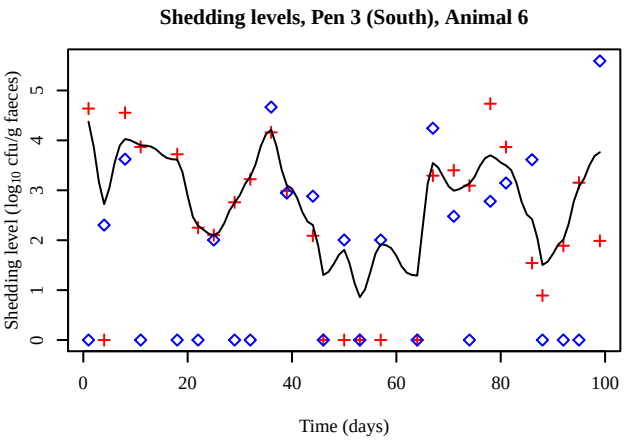

Shedding levels, Pen 3 (South), Animal 1 (SS)
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

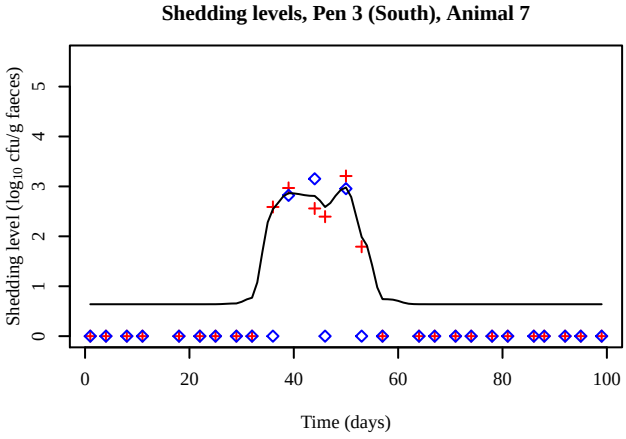

Shedding levels, Pen 3 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

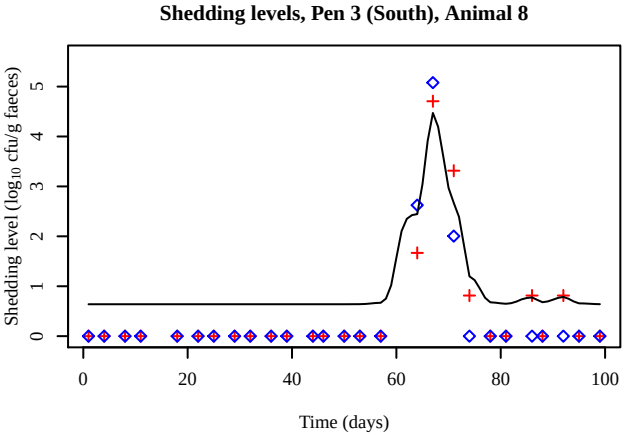

Shedding levels, Pen 3 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

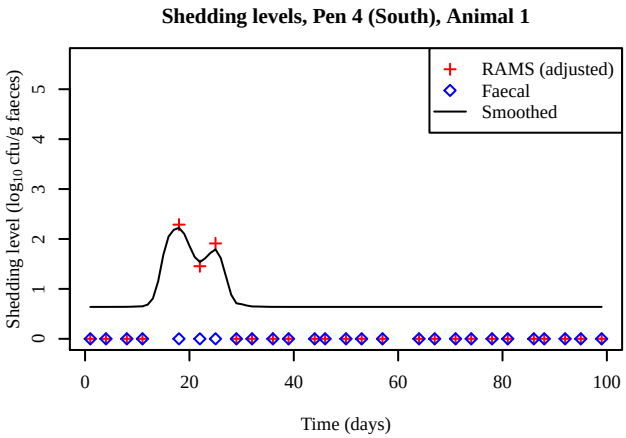

Shedding levels, Pen 3 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

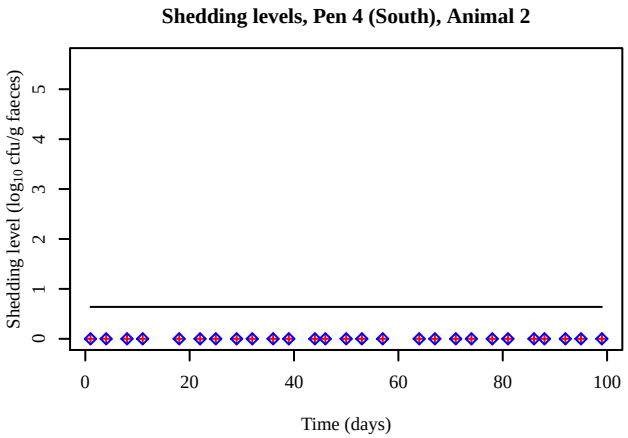

Shedding levels, Pen 3 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

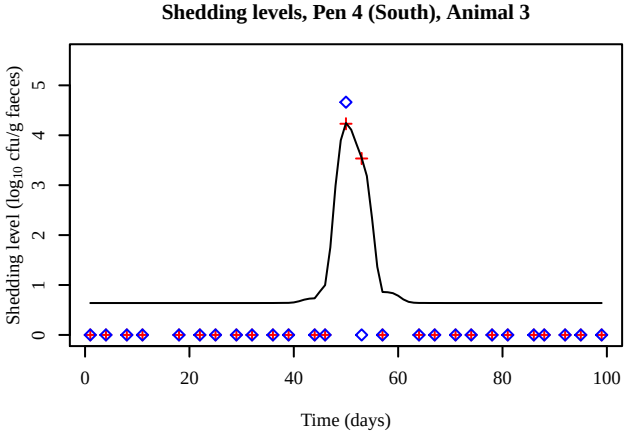

Shedding levels, Pen 3 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

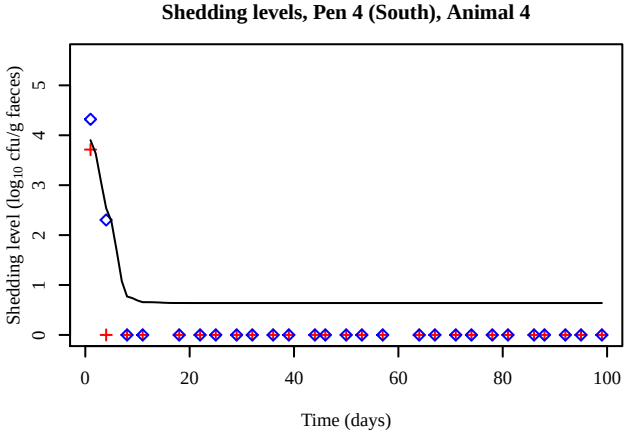

Shedding levels, Pen 3 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

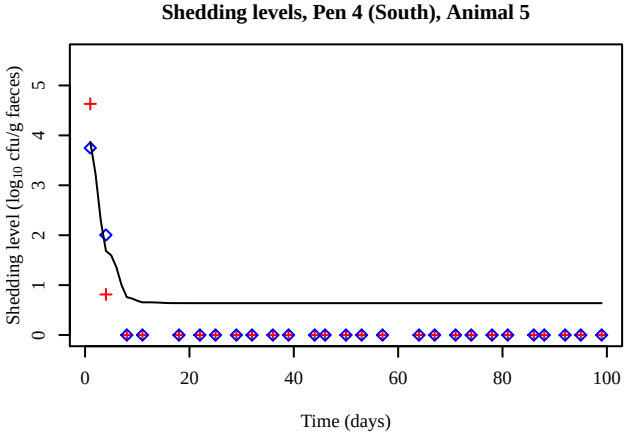

Shedding levels, Pen 3 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

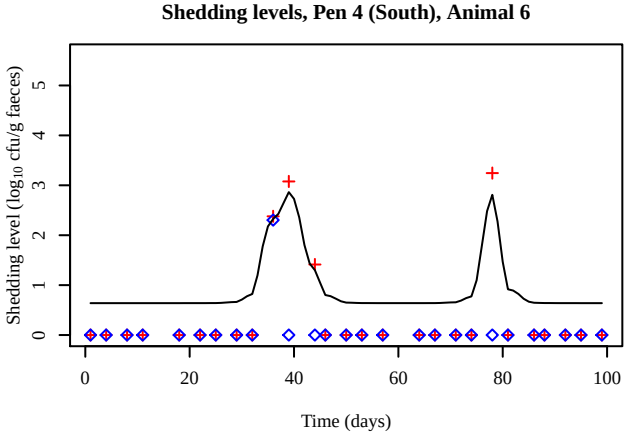

Shedding levels, Pen 4 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

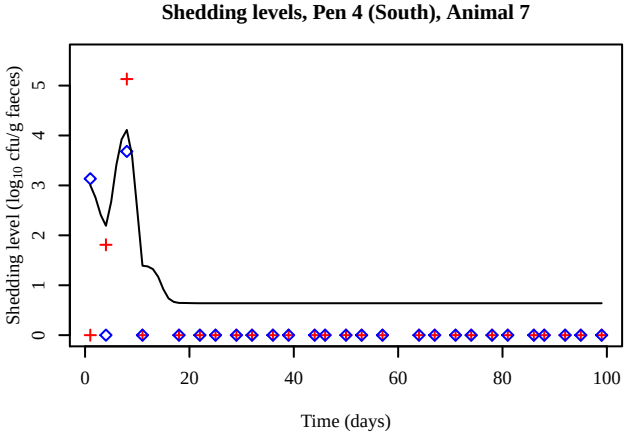

Shedding levels, Pen 4 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

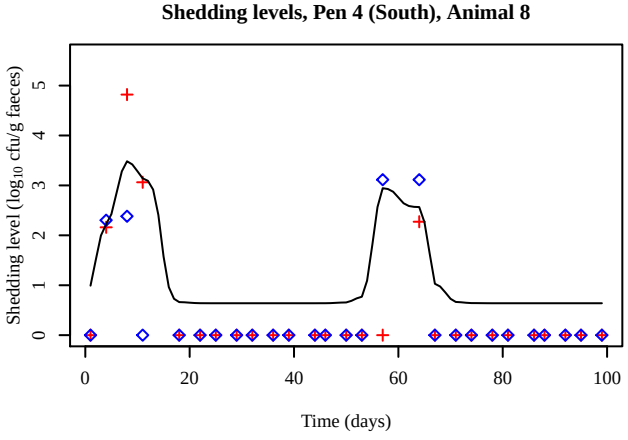

Shedding levels, Pen 4 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

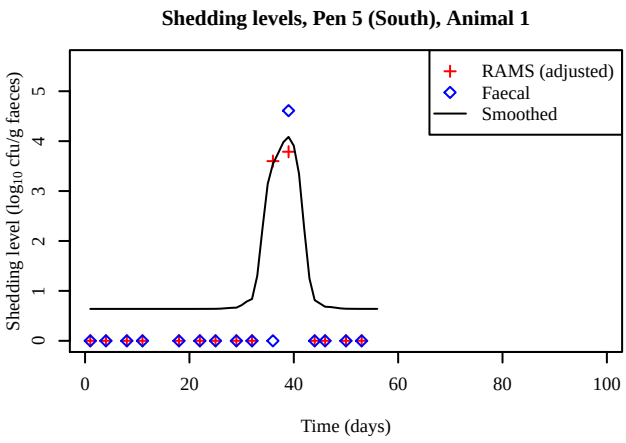

Shedding levels, Pen 4 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

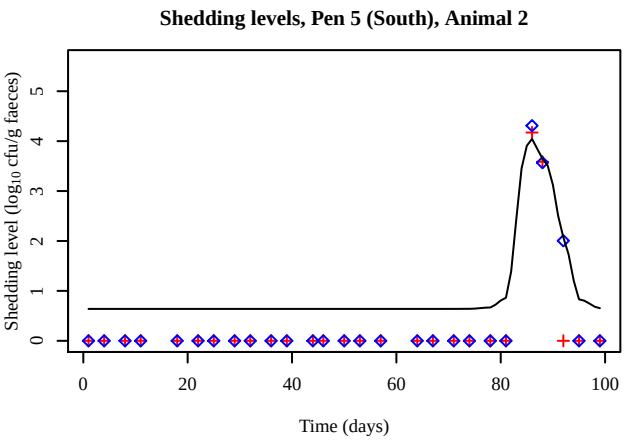

Shedding levels, Pen 4 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

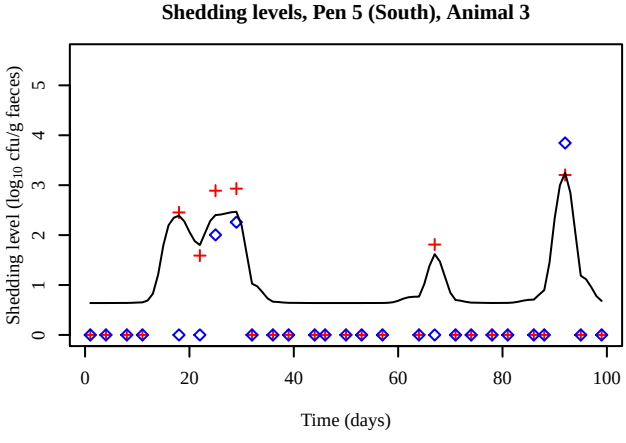

Shedding levels, Pen 4 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

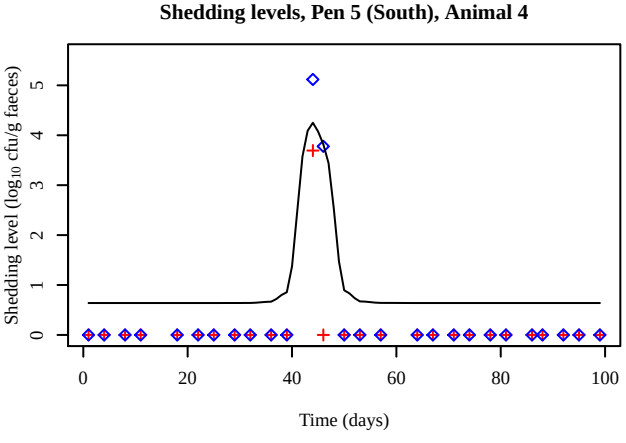

Shedding levels, Pen 4 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

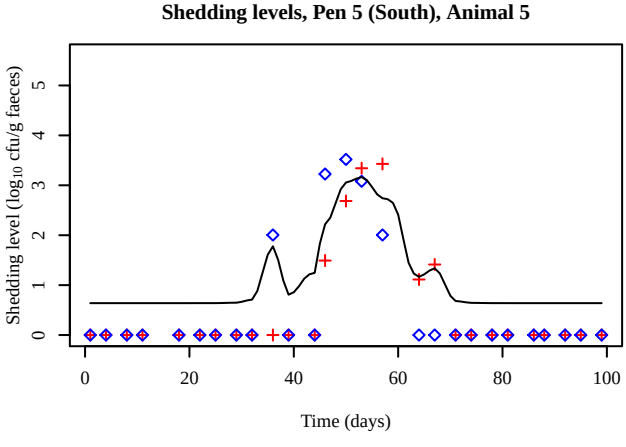

Shedding levels, Pen 4 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

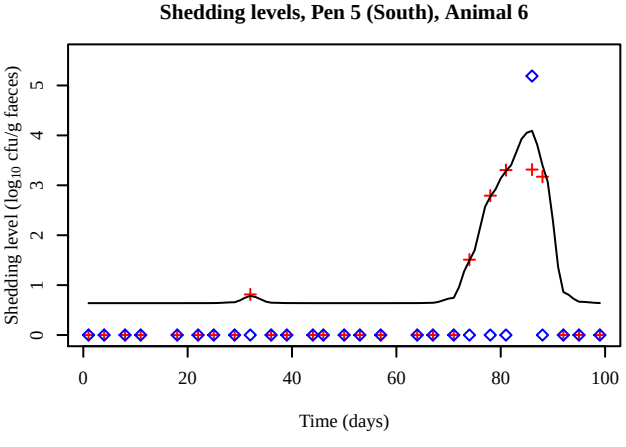

Shedding levels, Pen 5 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

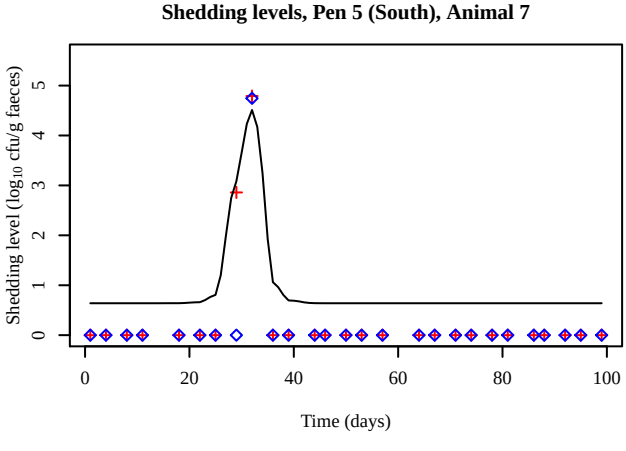

Shedding levels, Pen 5 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

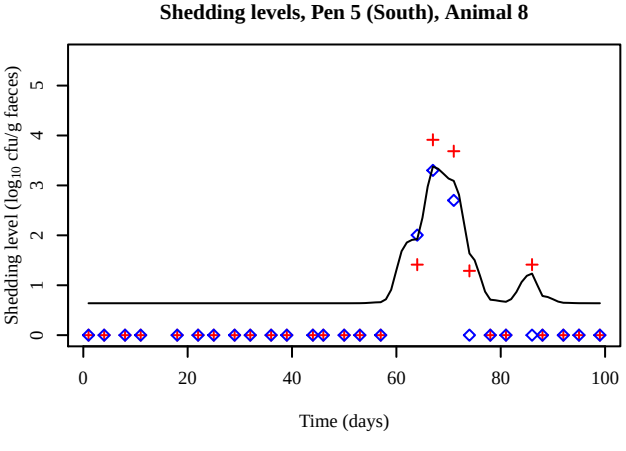

Shedding levels, Pen 5 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

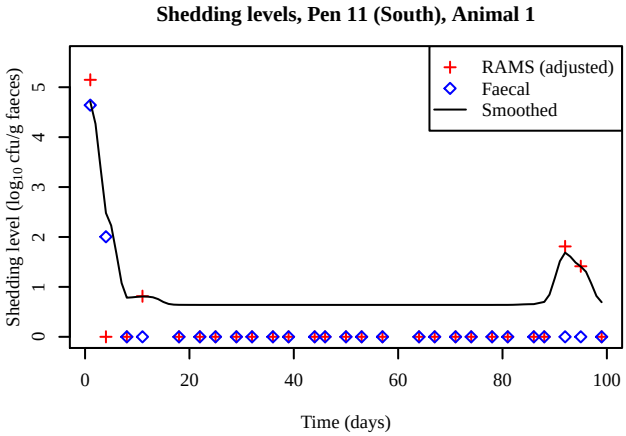

Shedding levels, Pen 5 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

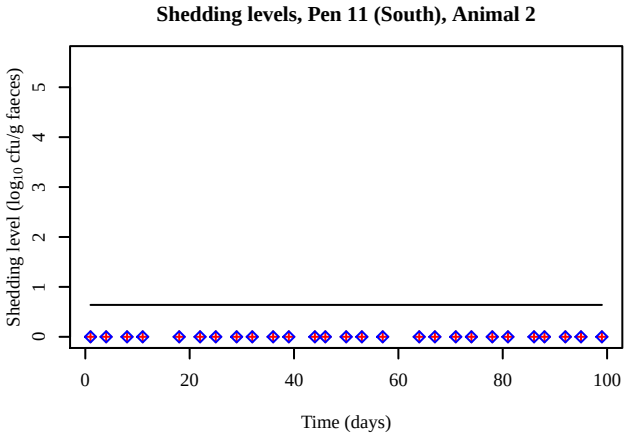

Shedding levels, Pen 5 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

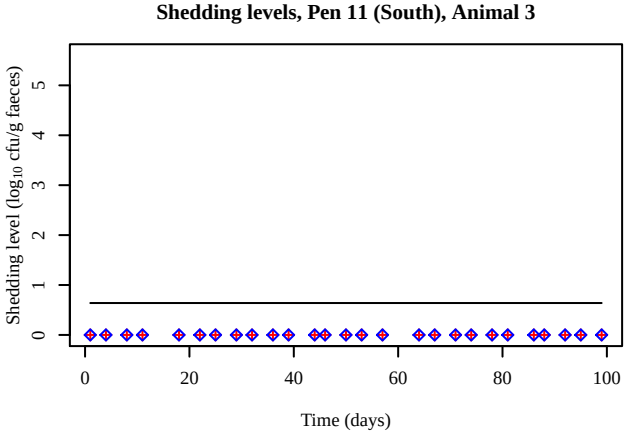

Shedding levels, Pen 5 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

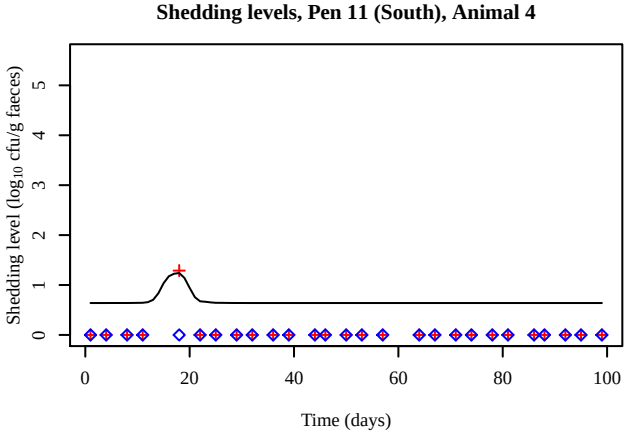

Shedding levels, Pen 5 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

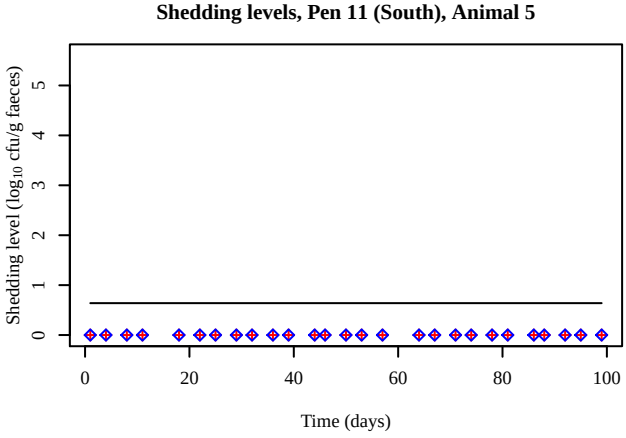

Shedding levels, Pen 5 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

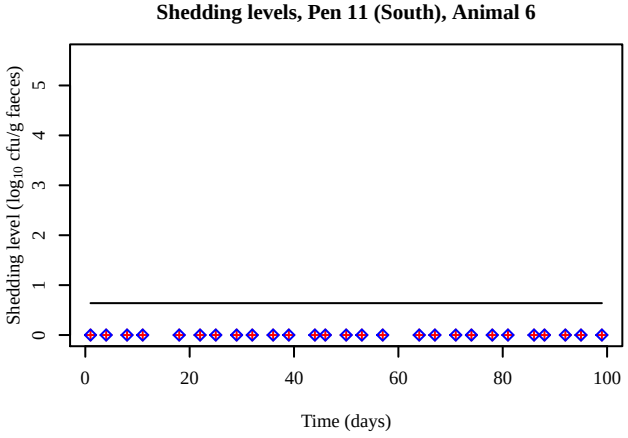

Shedding levels, Pen 11 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

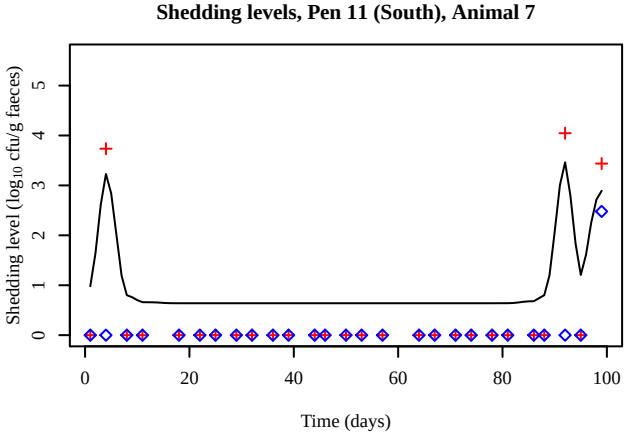

Shedding levels, Pen 11 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

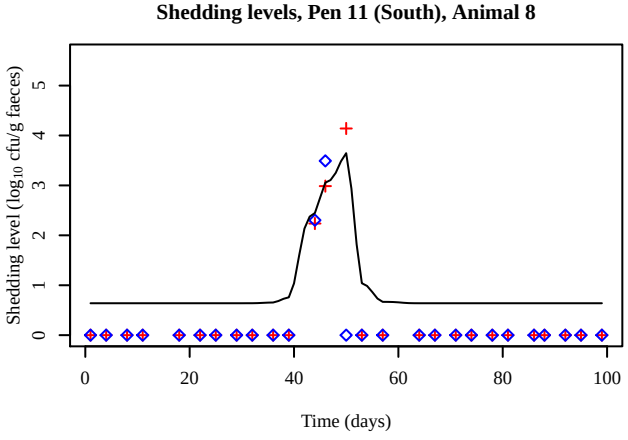

Shedding levels, Pen 11 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

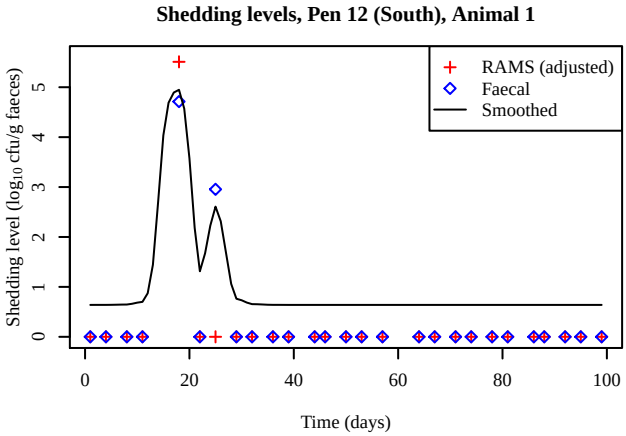

Shedding levels, Pen 11 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

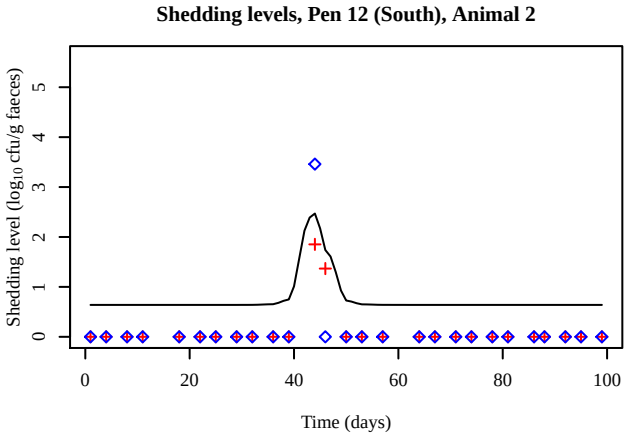

Shedding levels, Pen 11 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

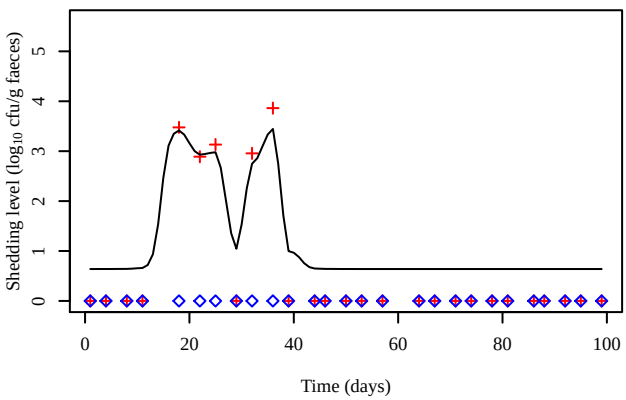

Shedding levels, Pen 11 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

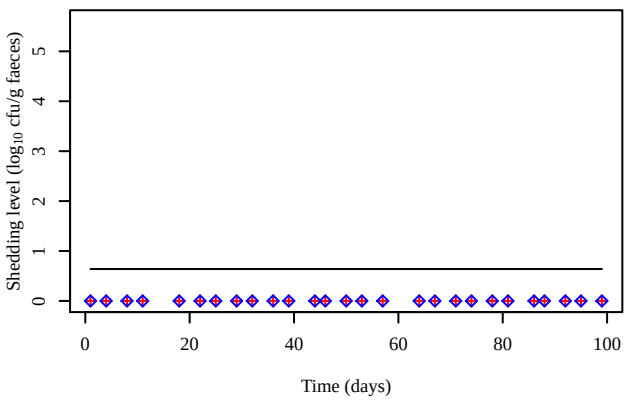

Shedding levels, Pen 11 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

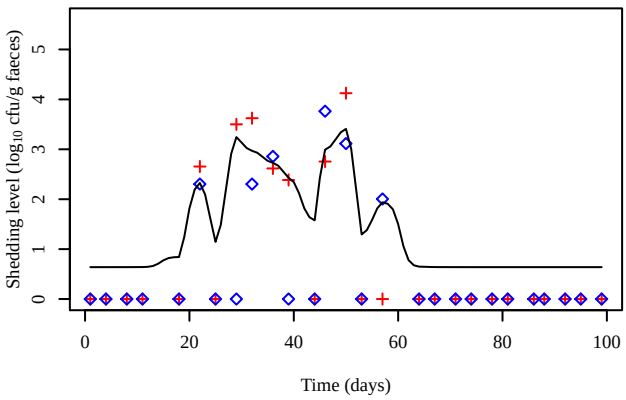

Shedding levels, Pen 11 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

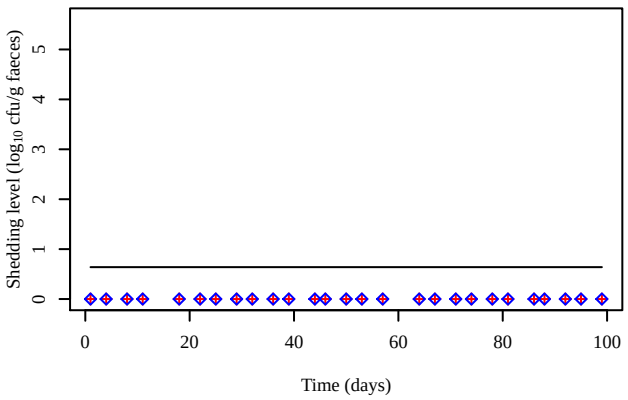

Shedding levels, Pen 12 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

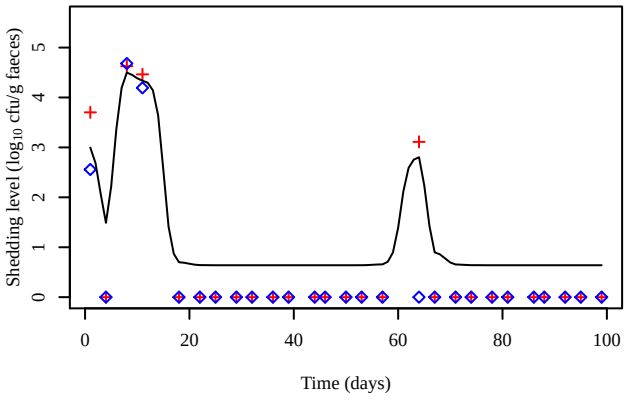

Shedding levels, Pen 12 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

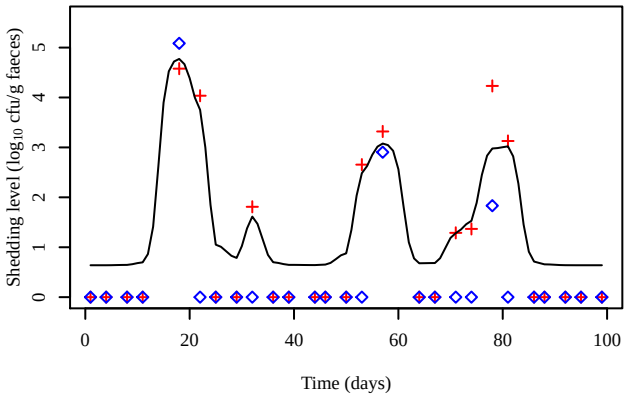

Shedding levels, Pen 12 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)

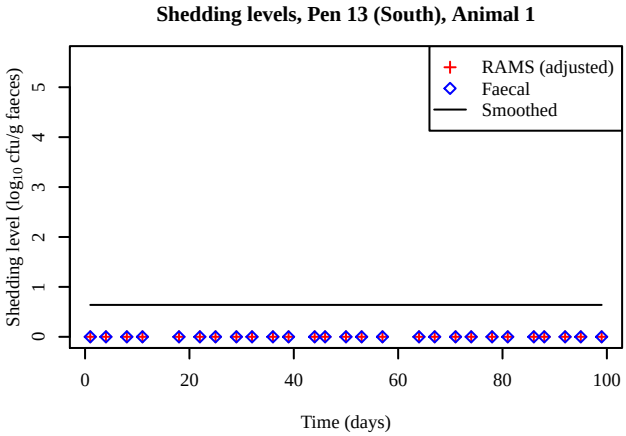

Shedding levels, Pen 12 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)

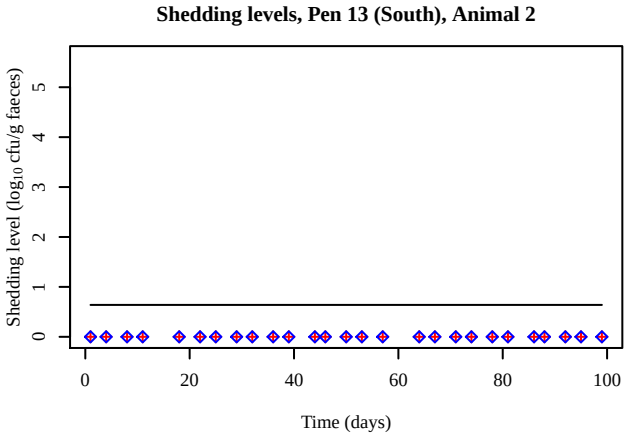

Shedding levels, Pen 12 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

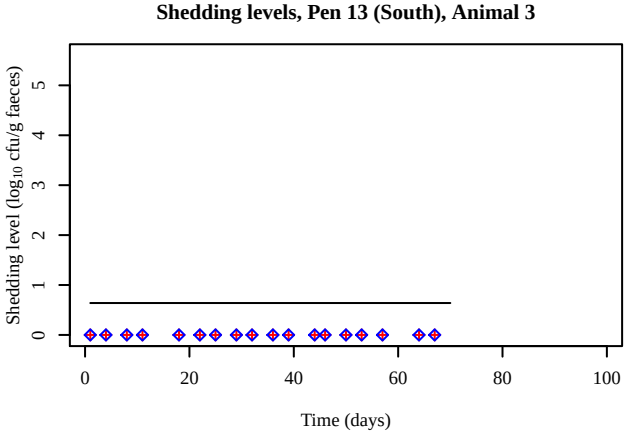

Shedding levels, Pen 12 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

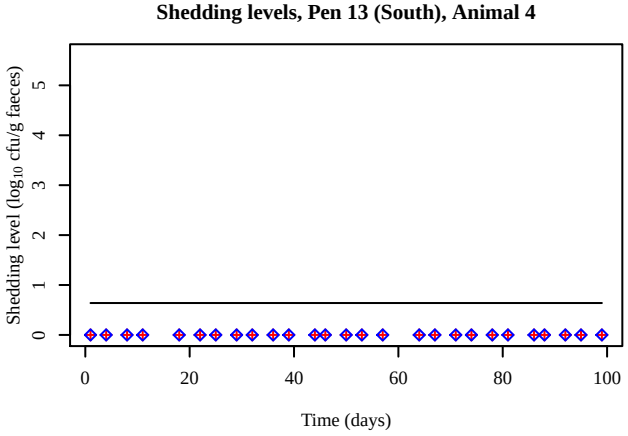

Shedding levels, Pen 12 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

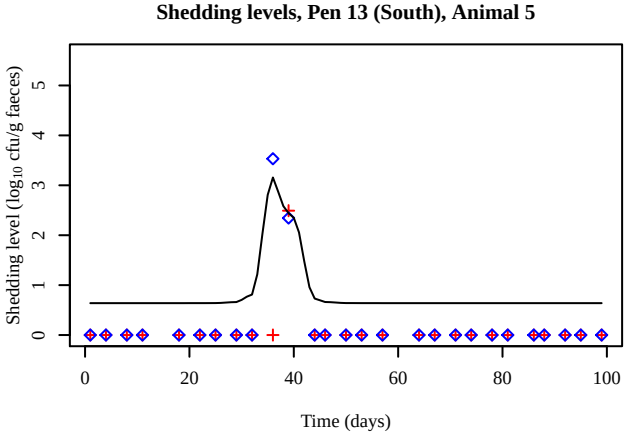

Shedding levels, Pen 12 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

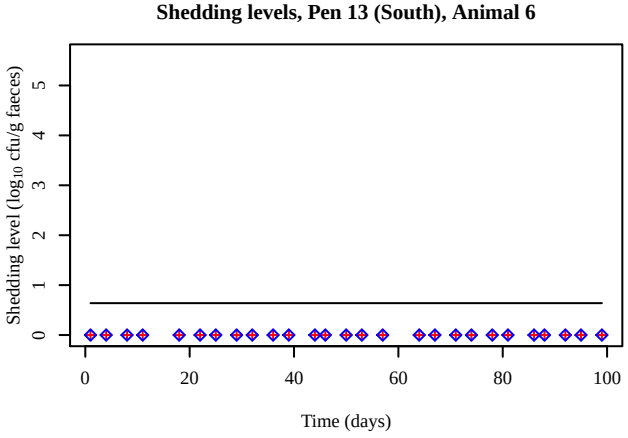

Shedding levels, Pen 13 (South), Animal 1
RAMS (adjusted)
Faecal
Smoothed
Shedding level (log10 cfu/g faeces)
Time (days)

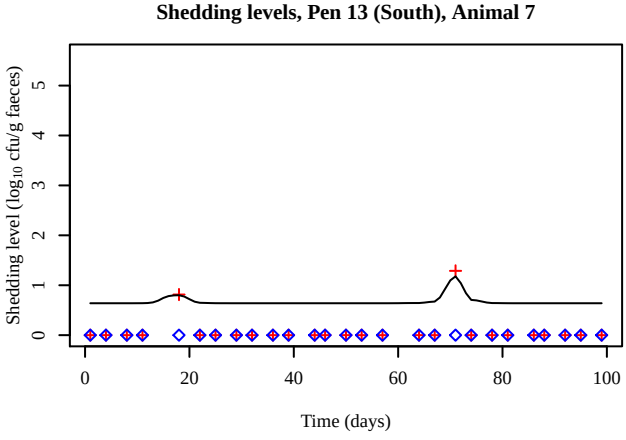

Shedding levels, Pen 13 (South), Animal 2
Shedding level (log10 cfu/g faeces)
Time (days)

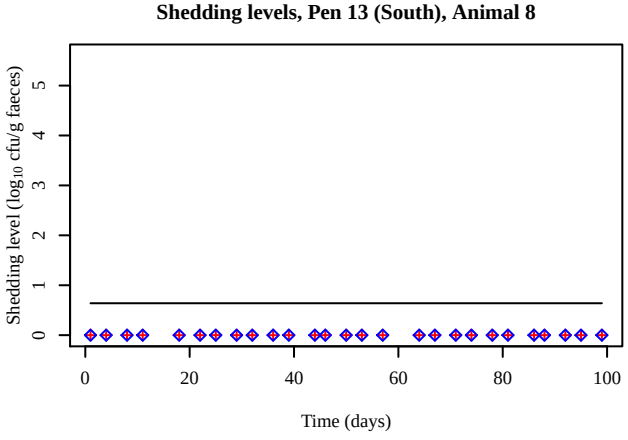

Shedding levels, Pen 13 (South), Animal 3
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 13 (South), Animal 4
Shedding level (log10 cfu/g faeces)
Time (days)


Shedding levels, Pen 13 (South), Animal 5
Shedding level (log10 cfu/g faeces)
Time (days)

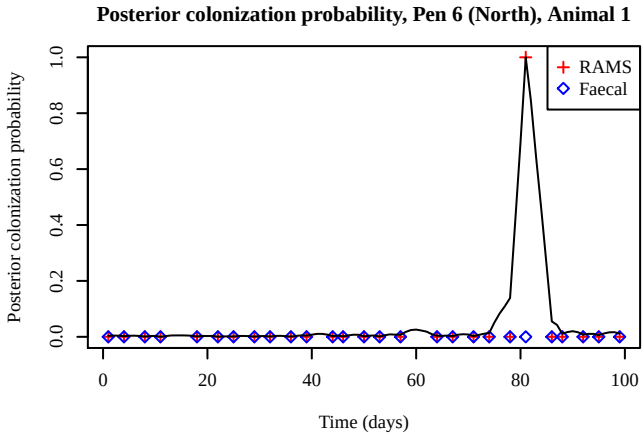

Shedding levels, Pen 13 (South), Animal 6
Shedding level (log10 cfu/g faeces)
Time (days)

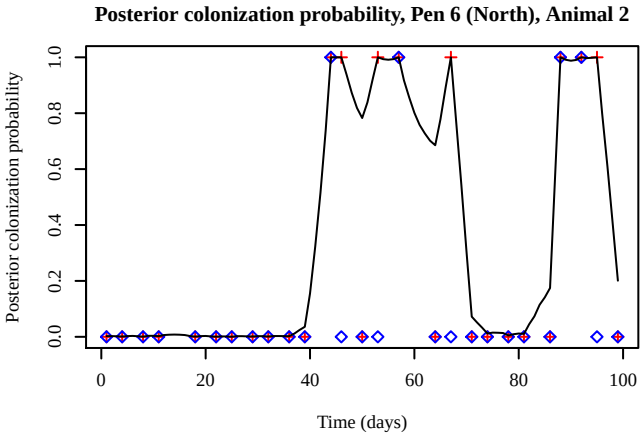

Shedding levels, Pen 13 (South), Animal 7
Shedding level (log10 cfu/g faeces)
Time (days)

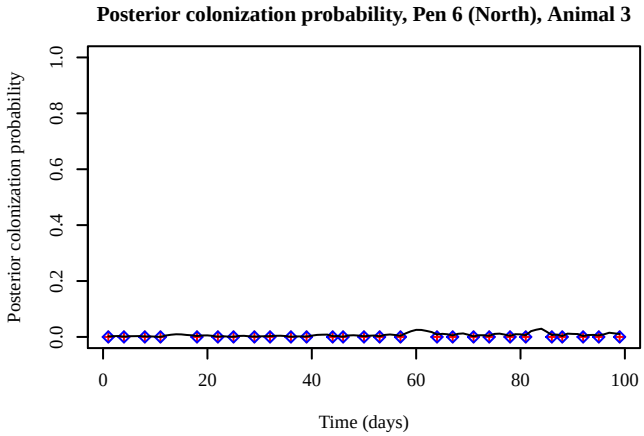

Shedding levels, Pen 13 (South), Animal 8
Shedding level (log10 cfu/g faeces)
Time (days)

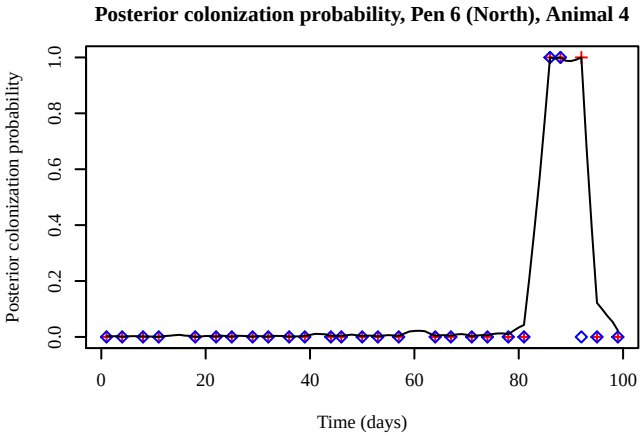
4 Posterior colonization probabilities

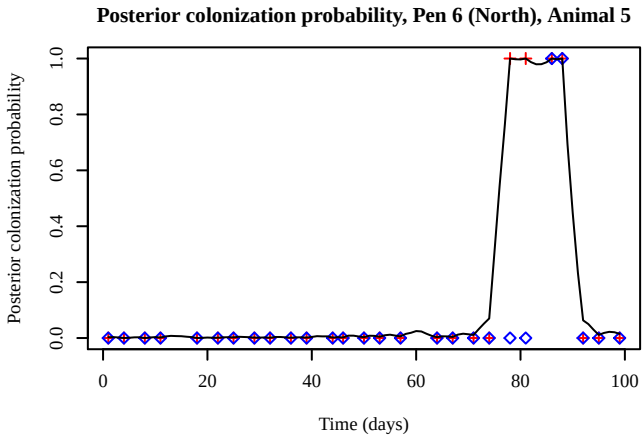
Posterior colonization probability with positive and negative tests marked at 1 and 0 respectively for the model described in Main Text Section 2.5. In this model the value of the supershedding threshold τ was inferred from the data. Plots are arranged so that each page constitutes the animals from a single pen. The letters "SS" indicate that the animal was identified as being a supershedder in [2].

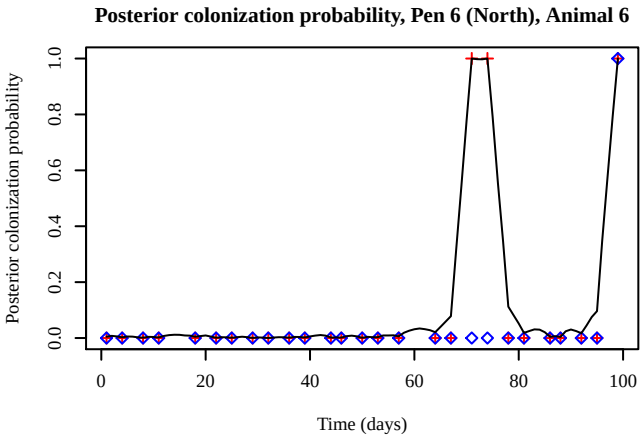

Posterior colonization probability, Pen 6 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

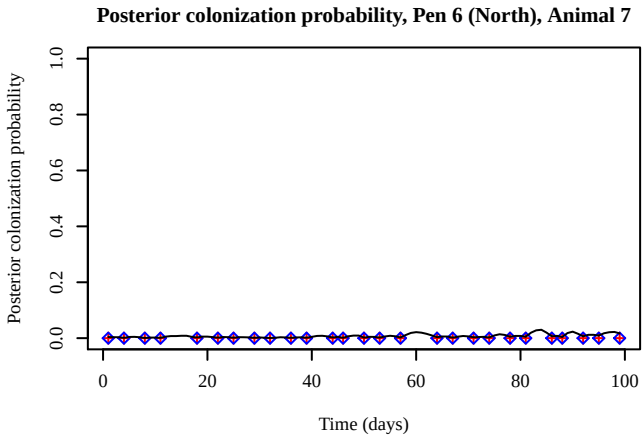

Posterior colonization probability, Pen 6 (North), Animal 2
Posterior colonization probability
Time (days)

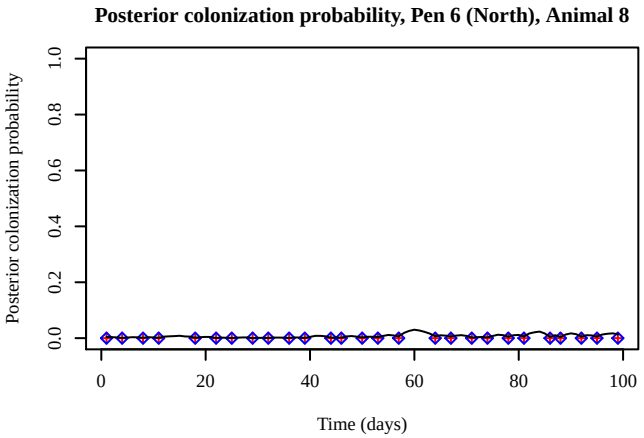

Posterior colonization probability, Pen 6 (North), Animal 3
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 6 (North), Animal 4
Posterior colonization probability
Time (days)

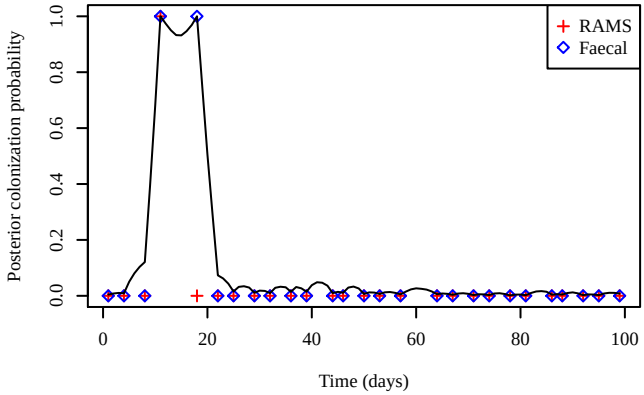

Posterior colonization probability, Pen 6 (North), Animal 5
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 6 (North), Animal 6
Posterior colonization probability
Time (days)

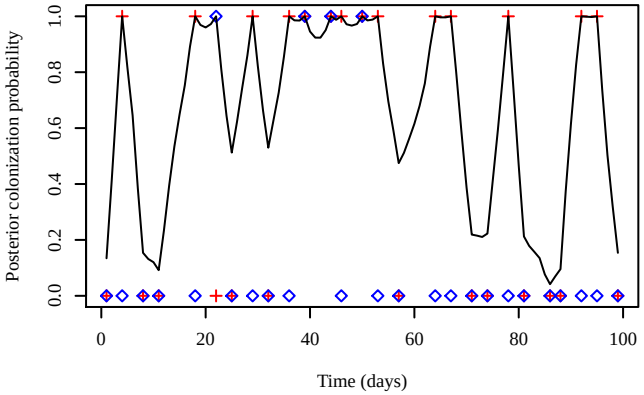

Posterior colonization probability, Pen 6 (North), Animal 7
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 6 (North), Animal 8
Posterior colonization probability
Time (days)

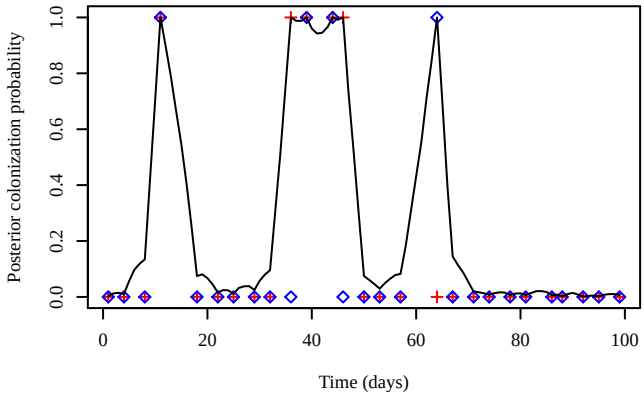
Posterior colonization probability, Pen 7 (North), Animal 1



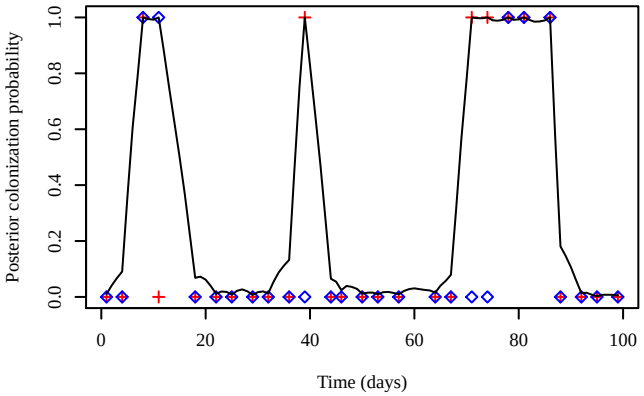
Posterior colonization probability, Pen 7 (North), Animal 2



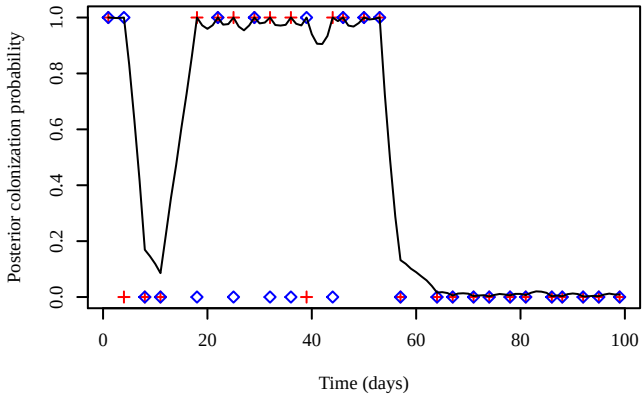
Posterior colonization probability, Pen 7 (North), Animal 3



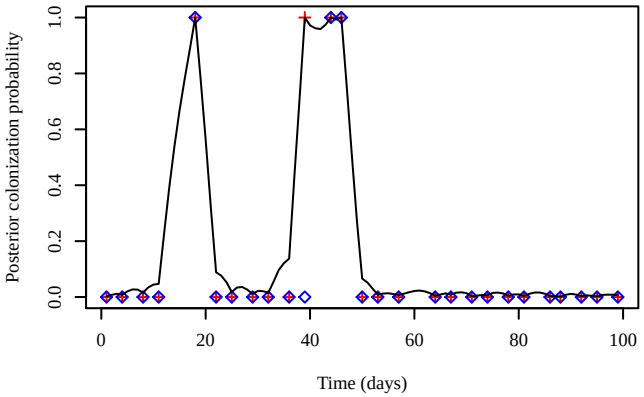
Posterior colonization probability, Pen 7 (North), Animal 4



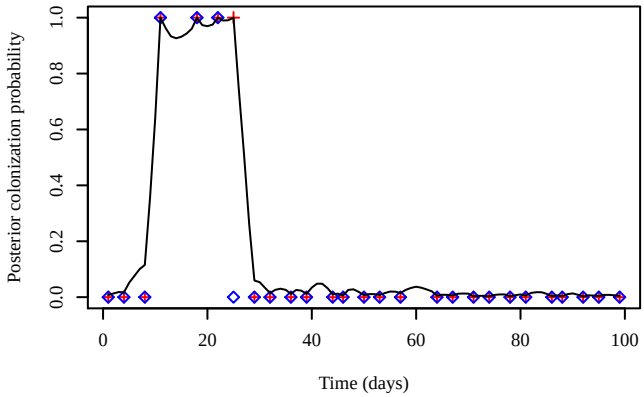
Posterior colonization probability, Pen 7 (North), Animal 5



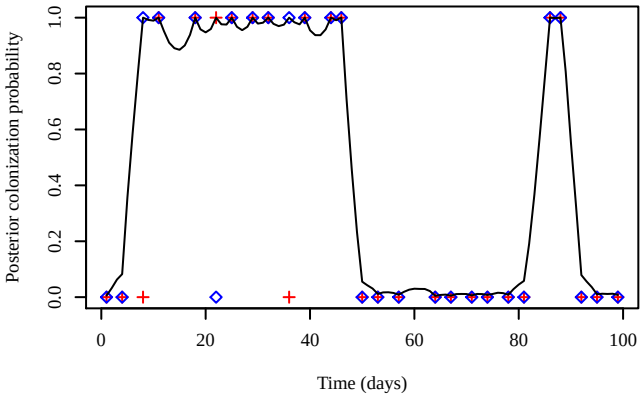
Posterior colonization probability, Pen 7 (North), Animal 6



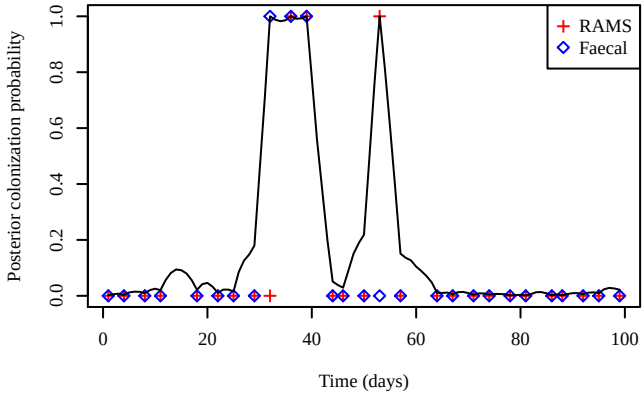
Posterior colonization probability, Pen 7 (North), Animal 7 (SS)



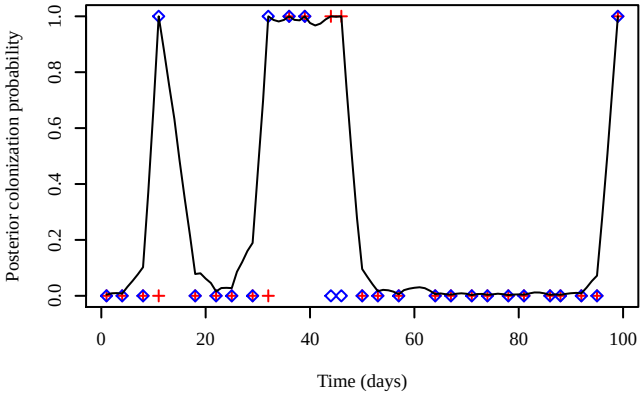
Posterior colonization probability, Pen 7 (North), Animal 8 (SS)



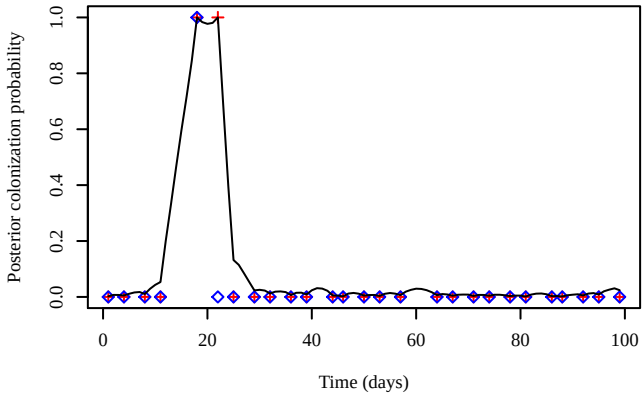
Posterior colonization probability, Pen 8 (North), Animal 1



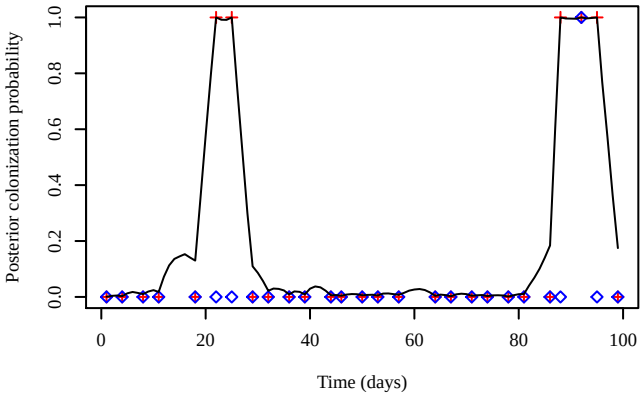
Posterior colonization probability, Pen 8 (North), Animal 2 (SS)



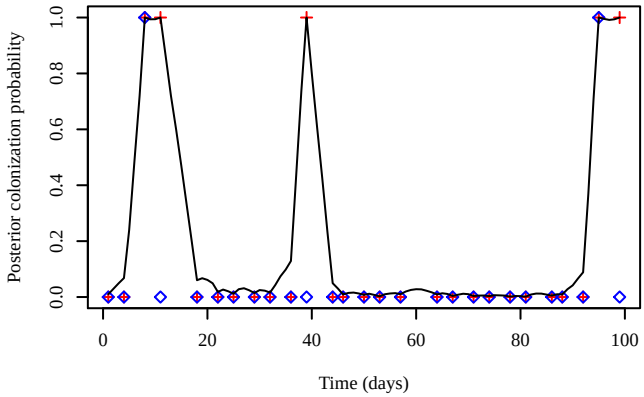
Posterior colonization probability, Pen 8 (North), Animal 3



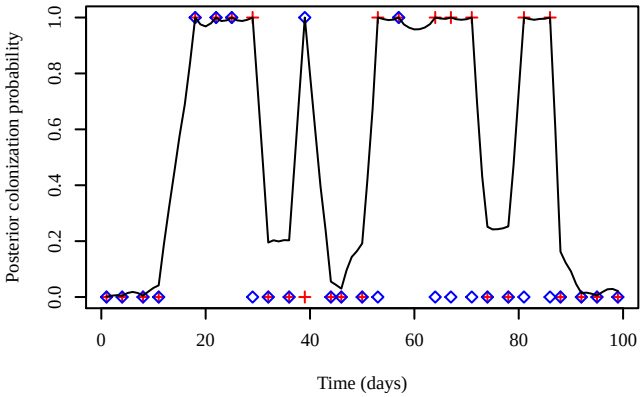
Posterior colonization probability, Pen 8 (North), Animal 4



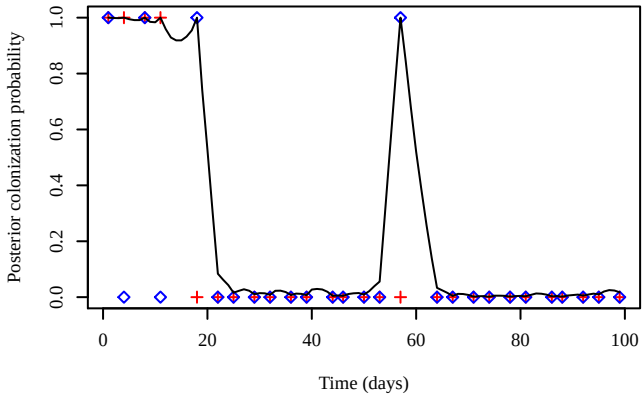
Posterior colonization probability, Pen 8 (North), Animal 5



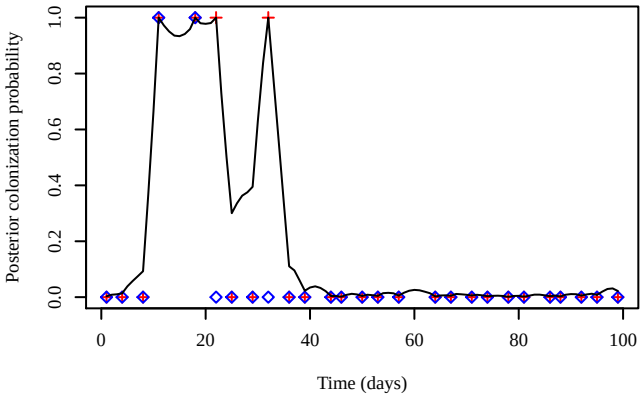
Posterior colonization probability, Pen 8 (North), Animal 6

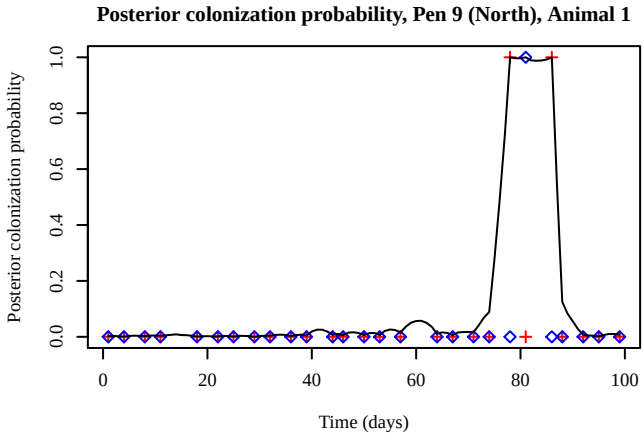


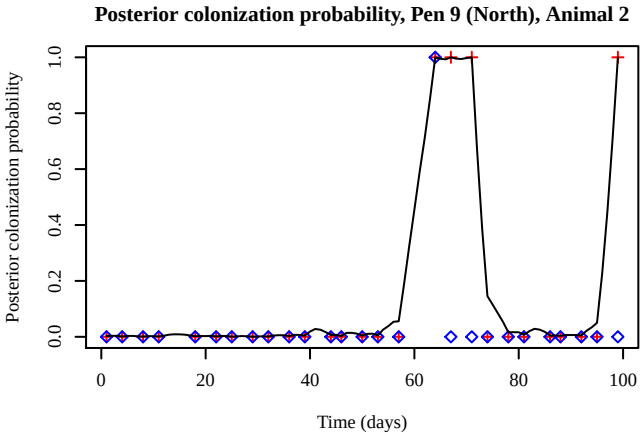
Posterior colonization probability, Pen 8 (North), Animal 7 (SS)

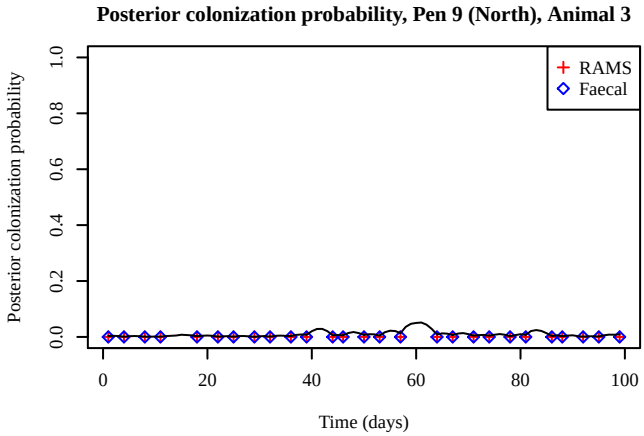


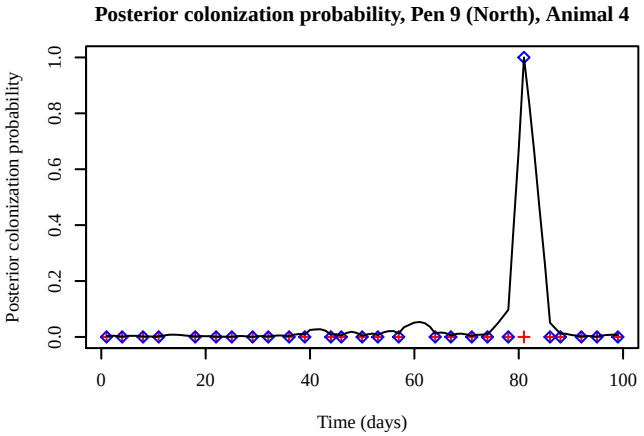
Posterior colonization probability, Pen 8 (North), Animal 8




Posterior colonization probability, Pen 9 (North), Animal 1
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 9 (North), Animal 2
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 9 (North), Animal 3
RAMS
Faecal
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 9 (North), Animal 4
Posterior colonization probability
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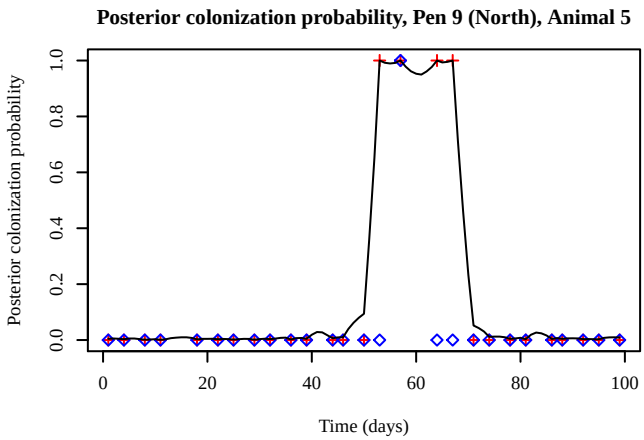
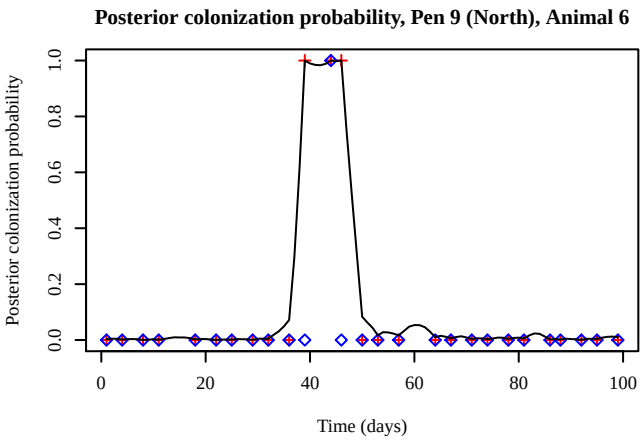
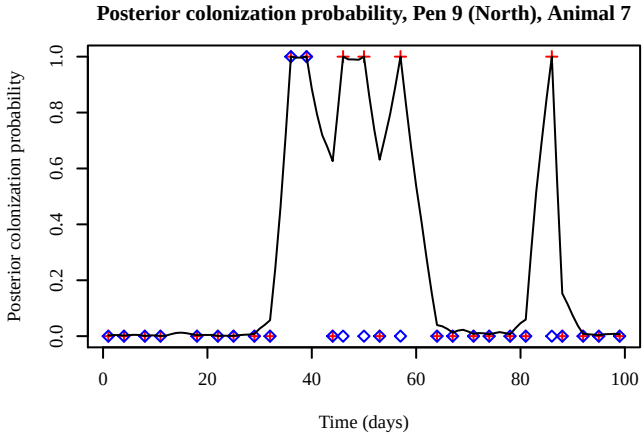
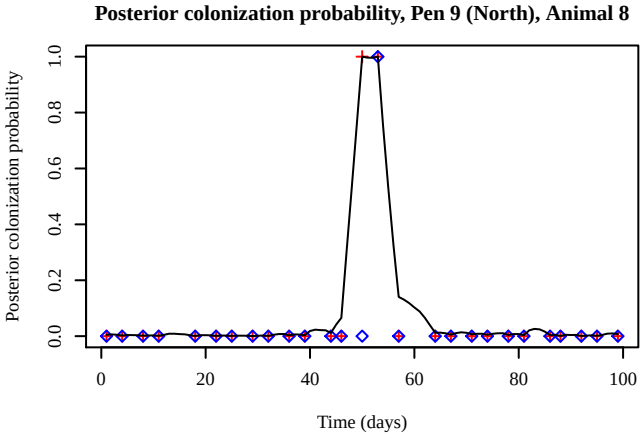
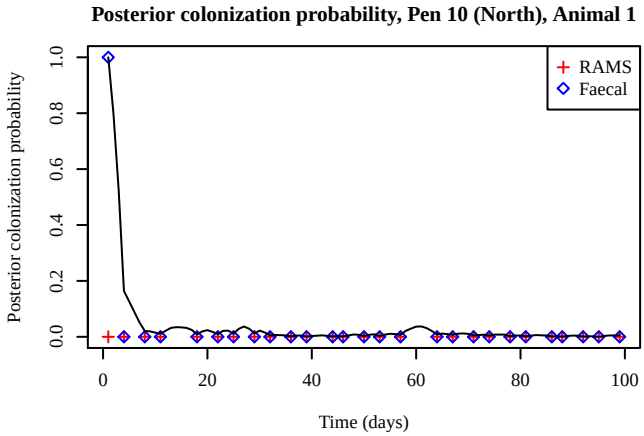
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

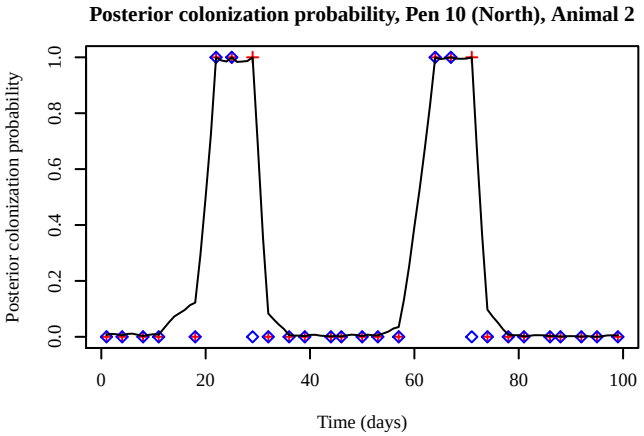

Posterior colonization probability, Pen 9 (North), Animal 5
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

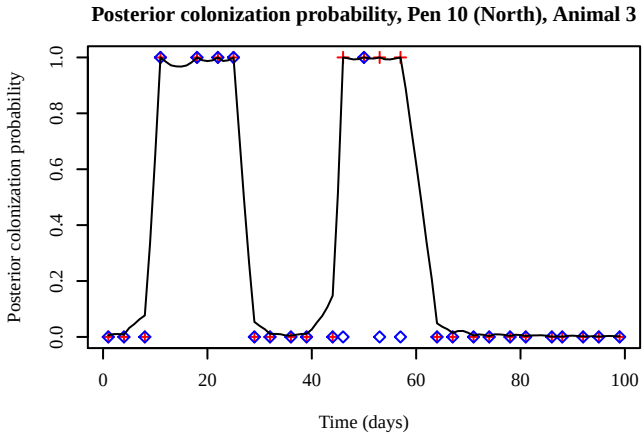

Posterior colonization probability, Pen 9 (North), Animal 6
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

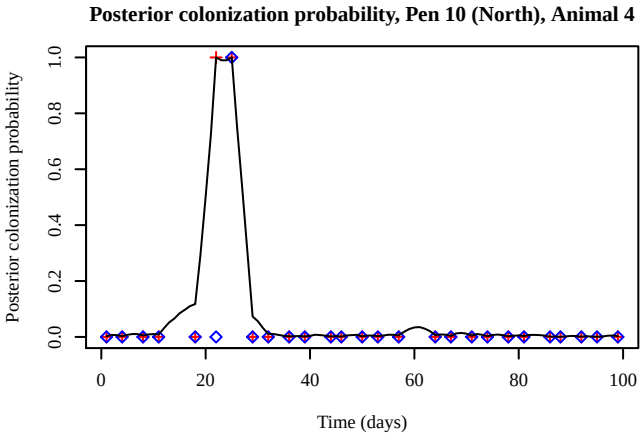

Posterior colonization probability, Pen 9 (North), Animal 7
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

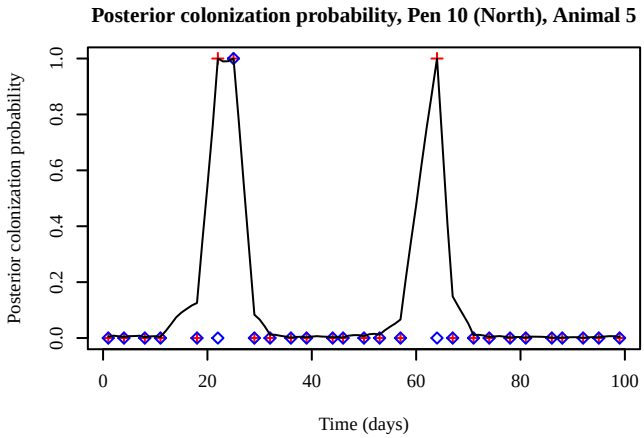

Posterior colonization probability, Pen 9 (North), Animal 8
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

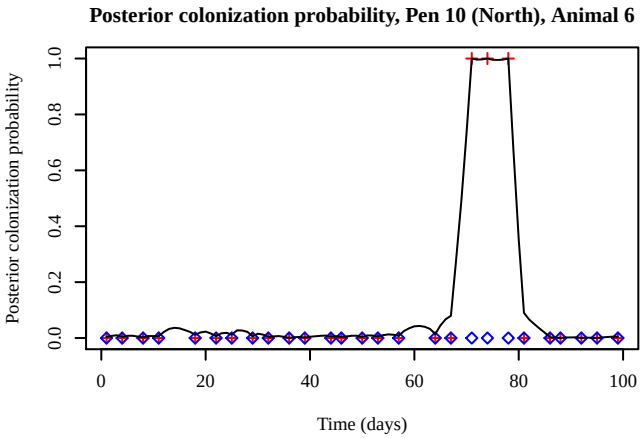

Posterior colonization probability, Pen 10 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

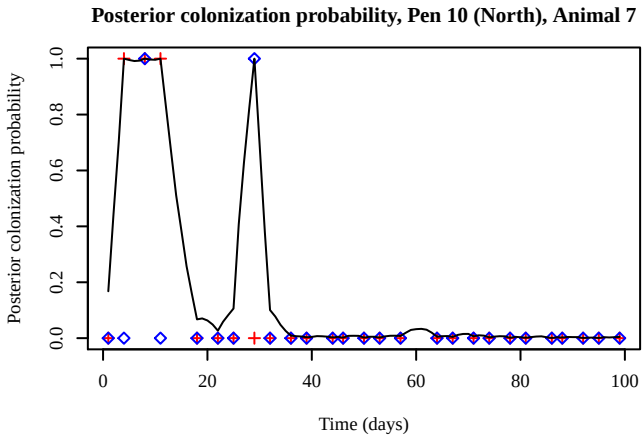

Posterior colonization probability, Pen 10 (North), Animal 2
Posterior colonization probability
Time (days)

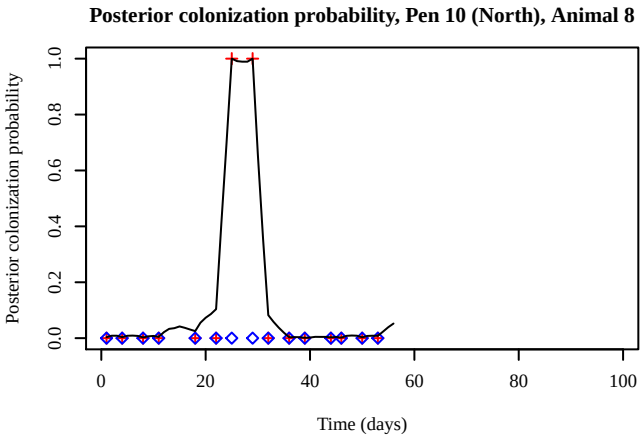

Posterior colonization probability, Pen 10 (North), Animal 3
Posterior colonization probability
Time (days)

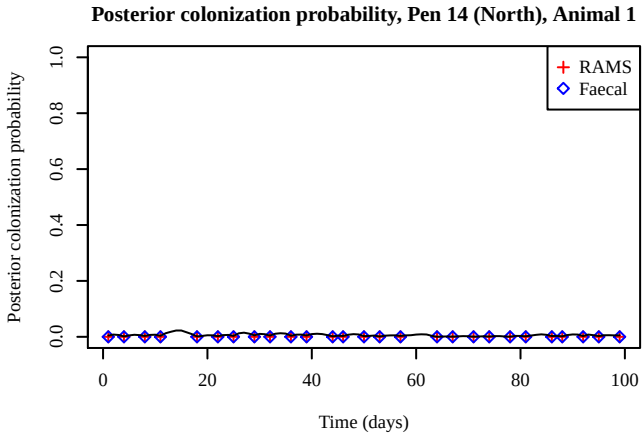

Posterior colonization probability, Pen 10 (North), Animal 4
Posterior colonization probability
Time (days)

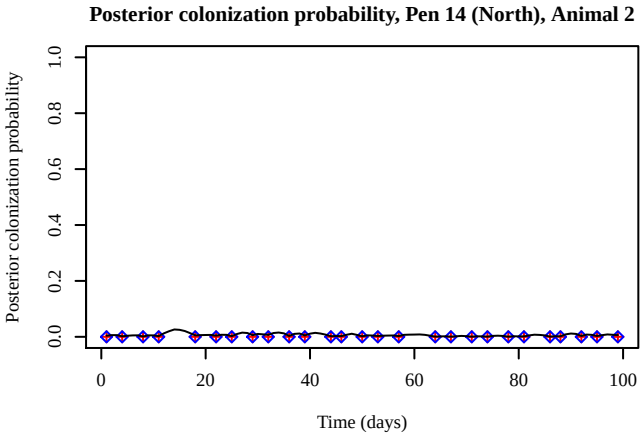

Posterior colonization probability, Pen 10 (North), Animal 5
Posterior colonization probability
Time (days)

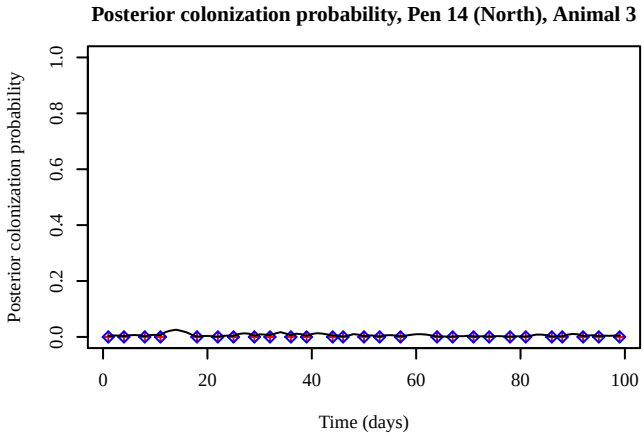

Posterior colonization probability, Pen 10 (North), Animal 6
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 10 (North), Animal 7
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 10 (North), Animal 8
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 2
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 3
Posterior colonization probability
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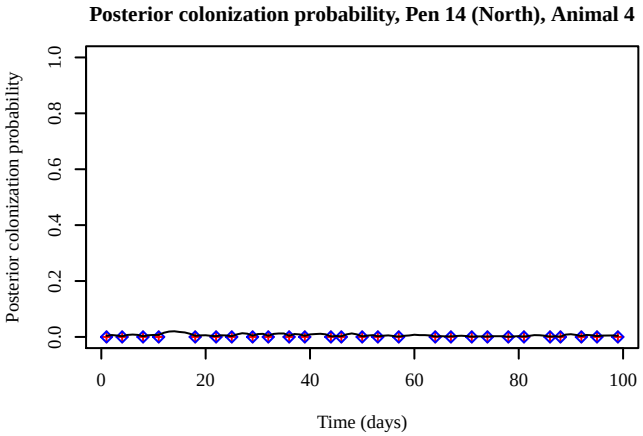
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 4
Posterior colonization probability
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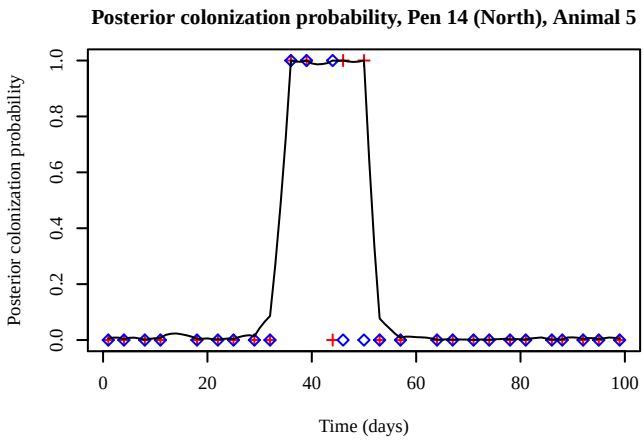
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 5
Posterior colonization probability
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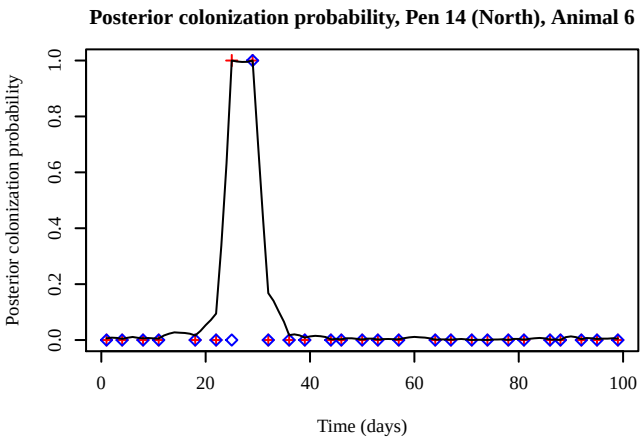
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 6
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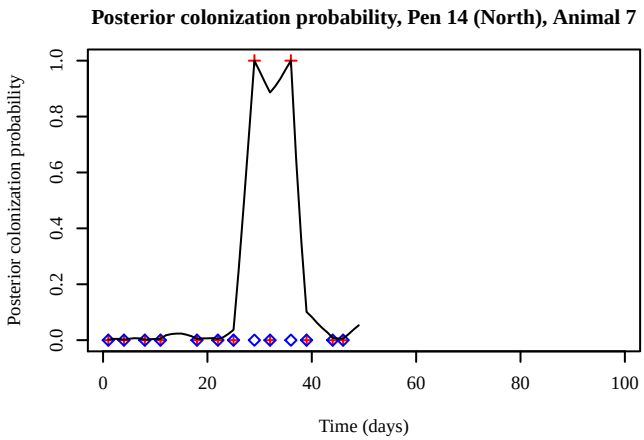
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 7
Posterior colonization probability
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1.0
0
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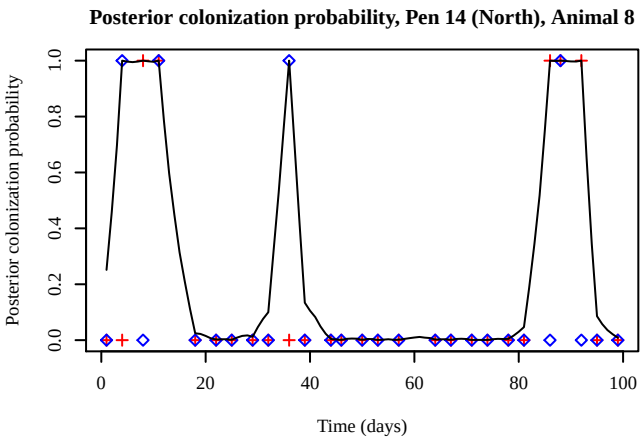
40
60
80
100
Time (days)


Posterior colonization probability, Pen 14 (North), Animal 8
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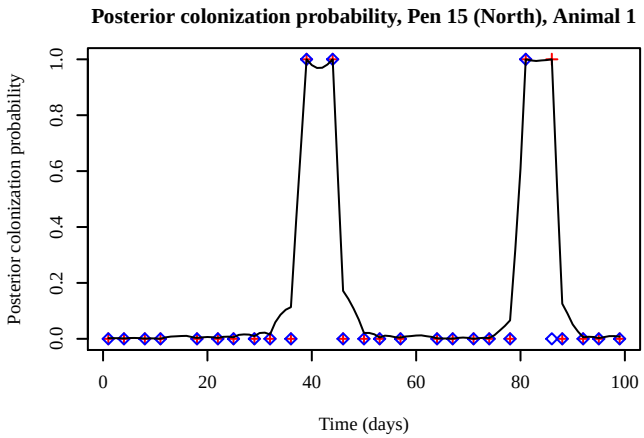
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 1
Posterior colonization probability
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0.6
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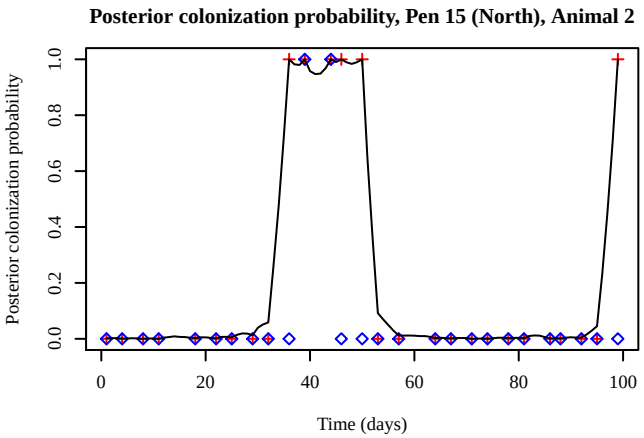
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 2
Posterior colonization probability
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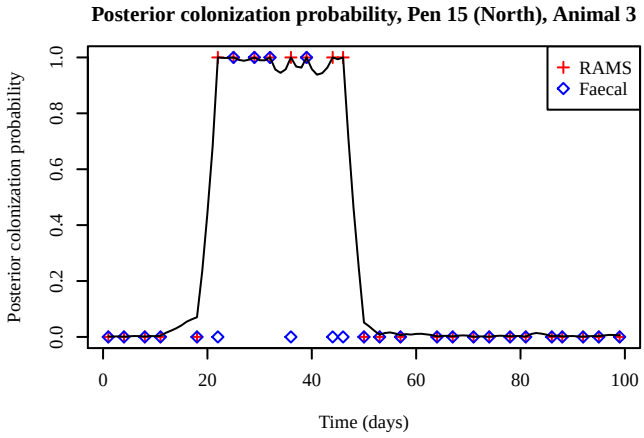
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 3
RAMS
Faecal
Posterior colonization probability
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0
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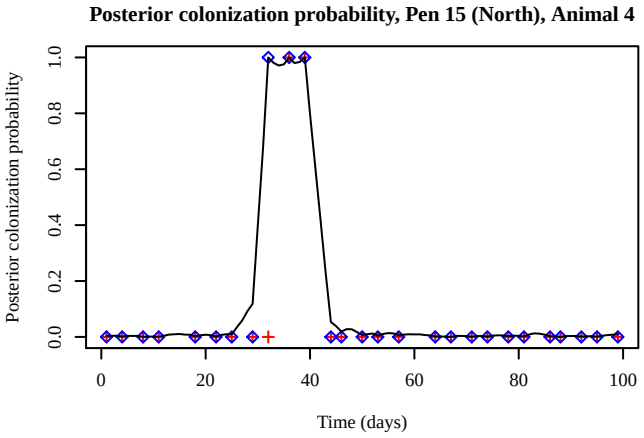
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 4
Posterior colonization probability
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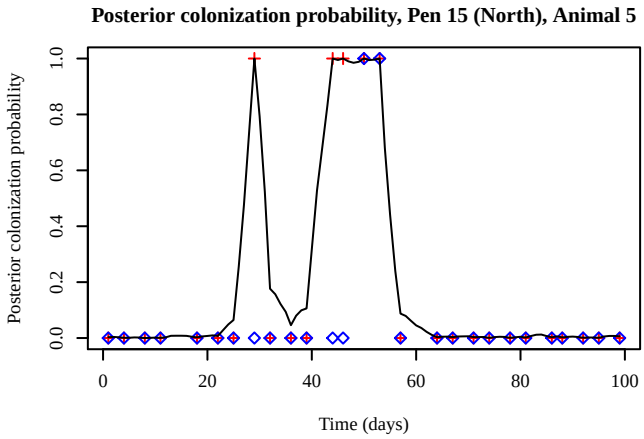
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 5
Posterior colonization probability
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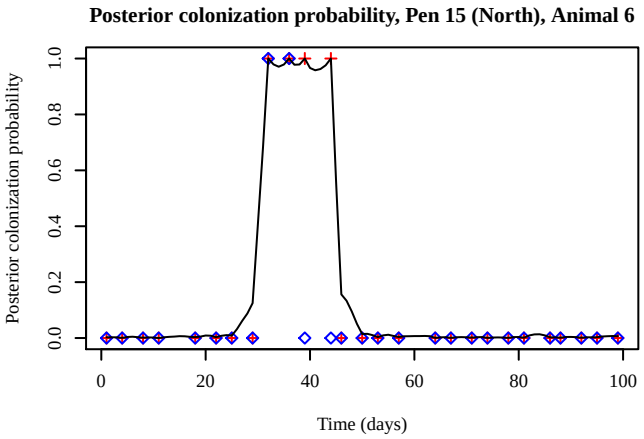
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 6
Posterior colonization probability
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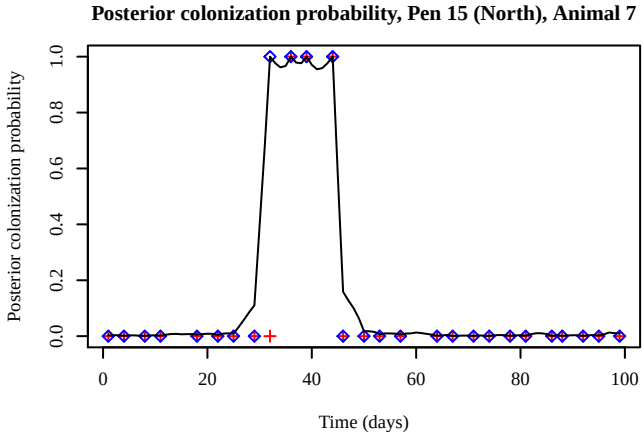
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 7
Posterior colonization probability
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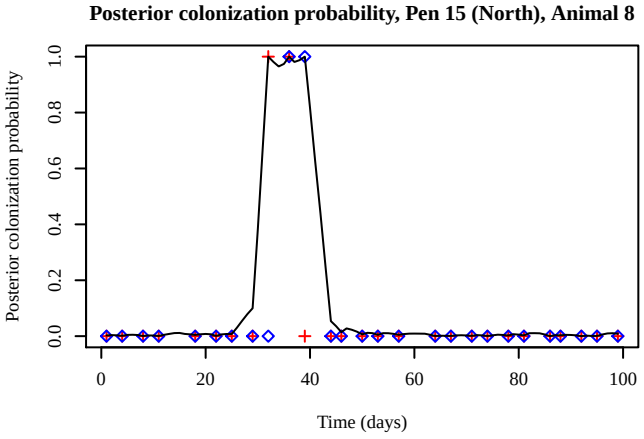
60
80
100
Time (days)


Posterior colonization probability, Pen 15 (North), Animal 8
Posterior colonization probability
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0.8
1.0
0
20
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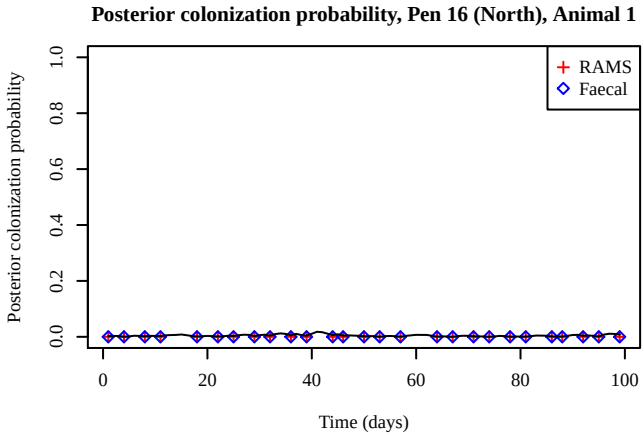
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
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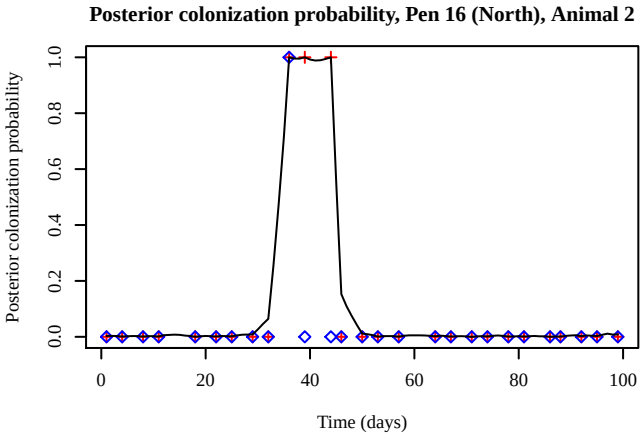
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 2
Posterior colonization probability
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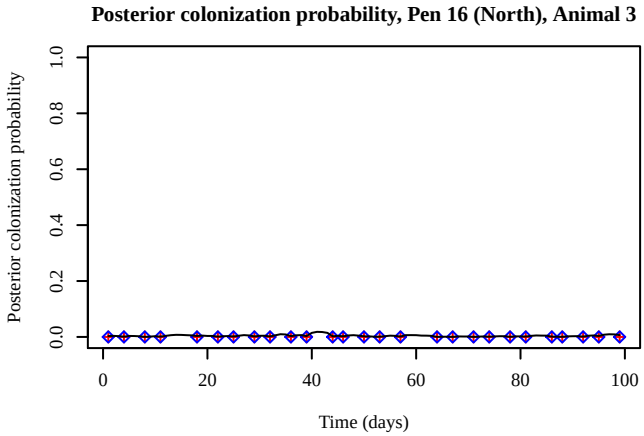
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 3
Posterior colonization probability
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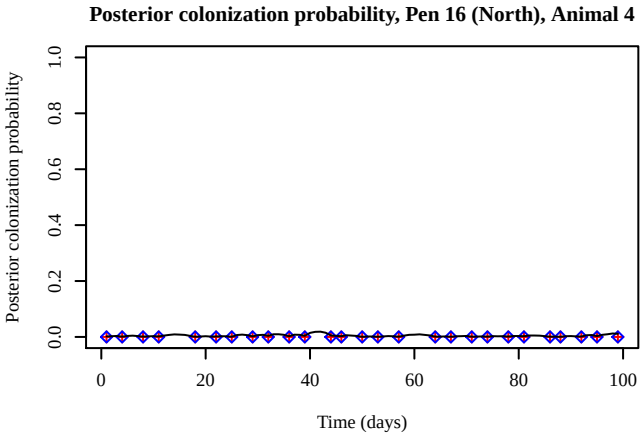
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 4
Posterior colonization probability
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0.6
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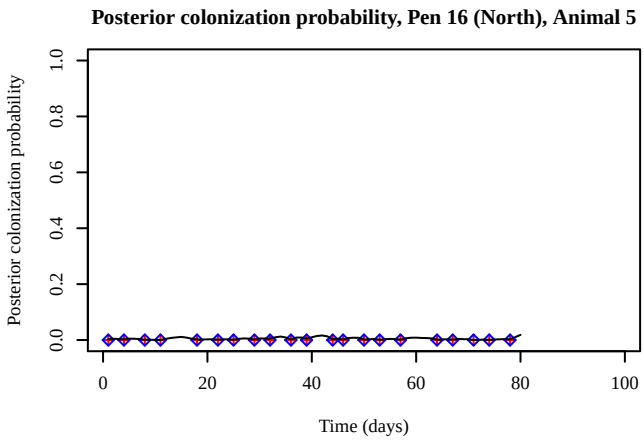
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 5
Posterior colonization probability
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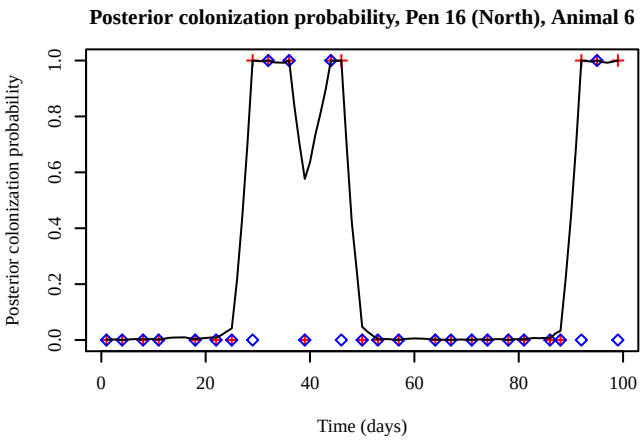
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 6
Posterior colonization probability
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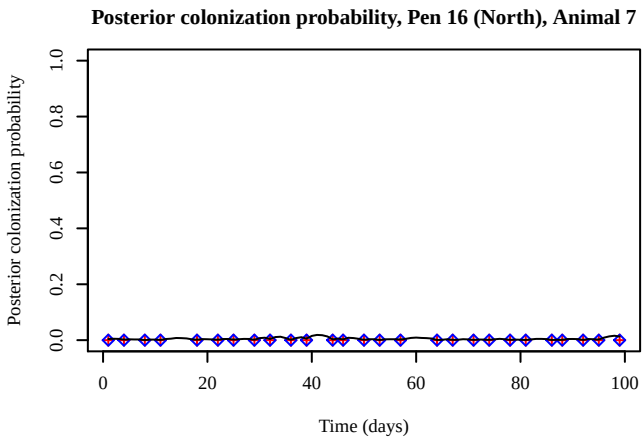
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 7
Posterior colonization probability
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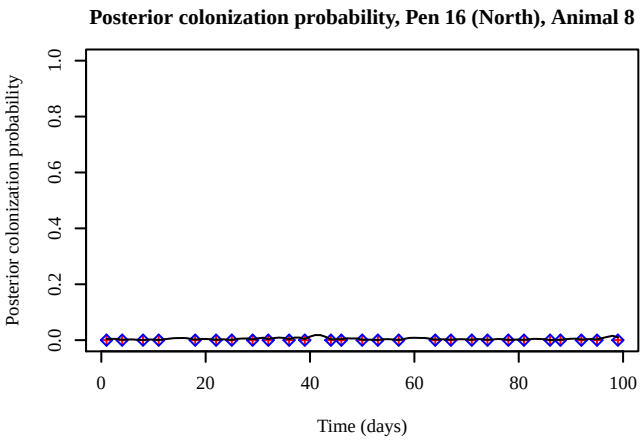
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 16 (North), Animal 8
Posterior colonization probability
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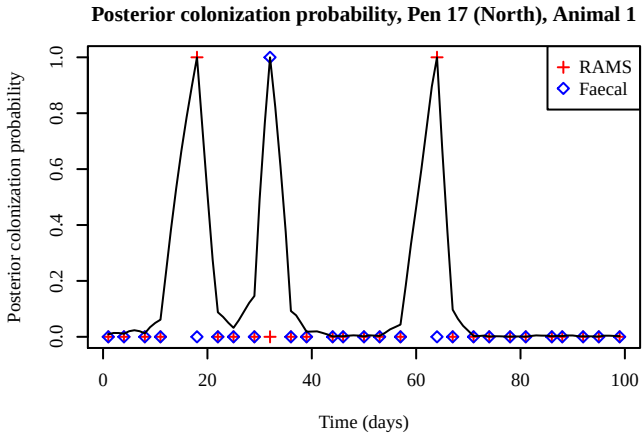
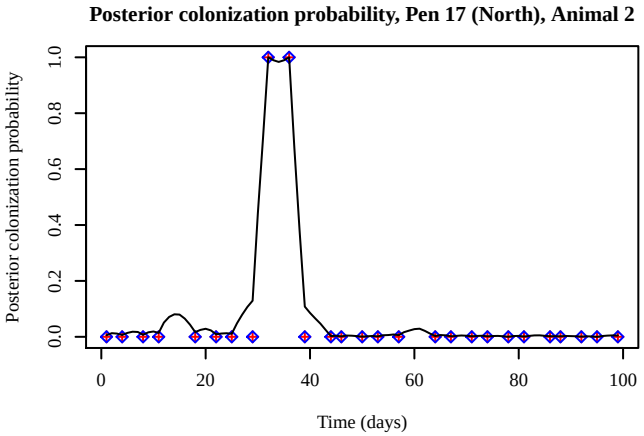
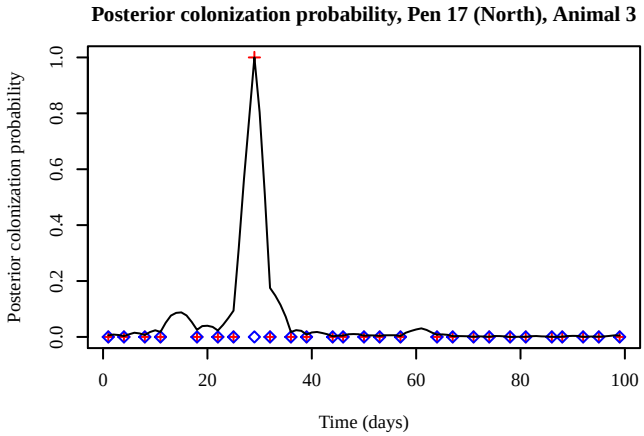
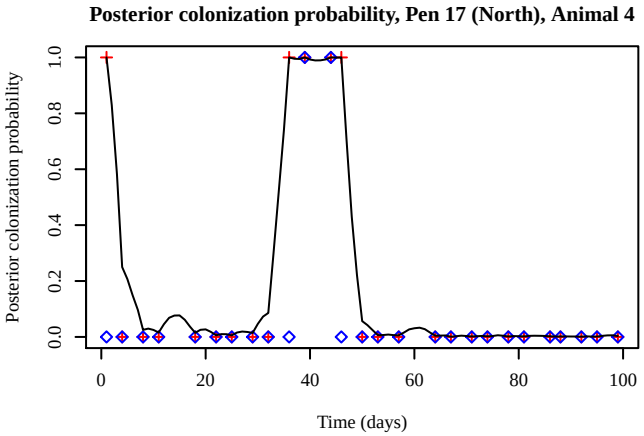
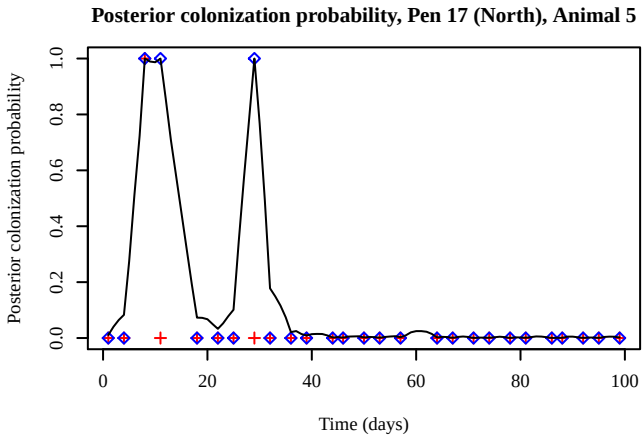
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

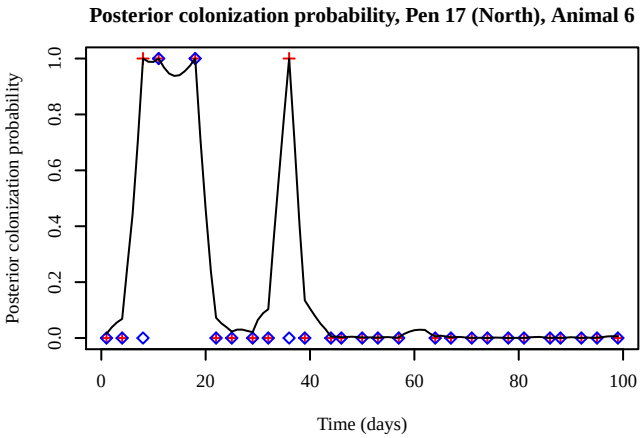

Posterior colonization probability, Pen 17 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

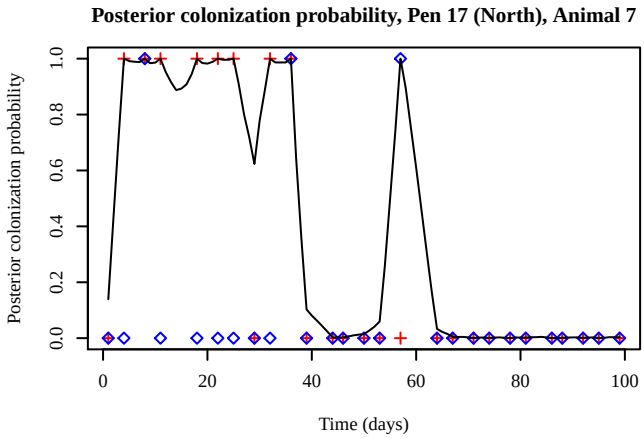

Posterior colonization probability, Pen 17 (North), Animal 2
Posterior colonization probability
Time (days)

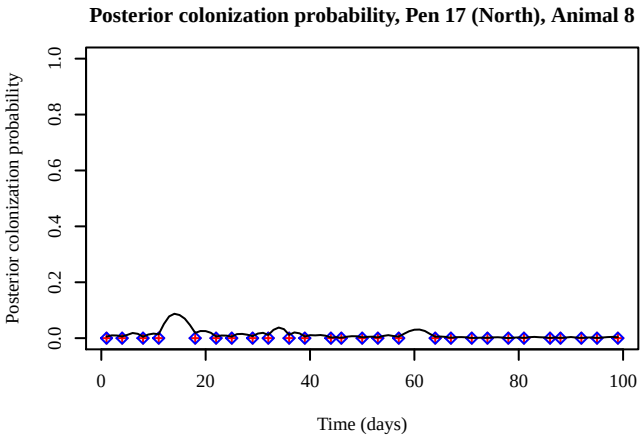

Posterior colonization probability, Pen 17 (North), Animal 3
Posterior colonization probability
Time (days)

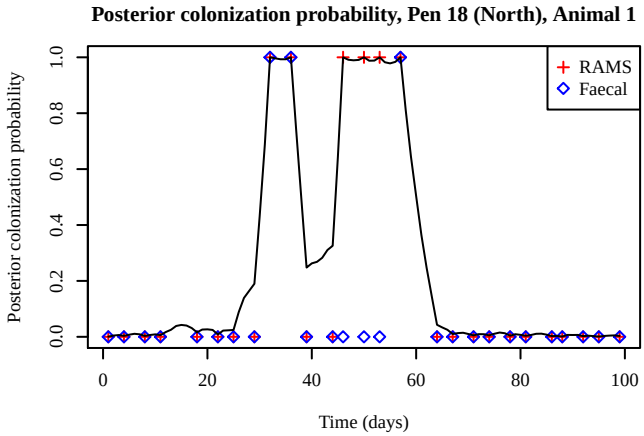

Posterior colonization probability, Pen 17 (North), Animal 4
Posterior colonization probability
Time (days)

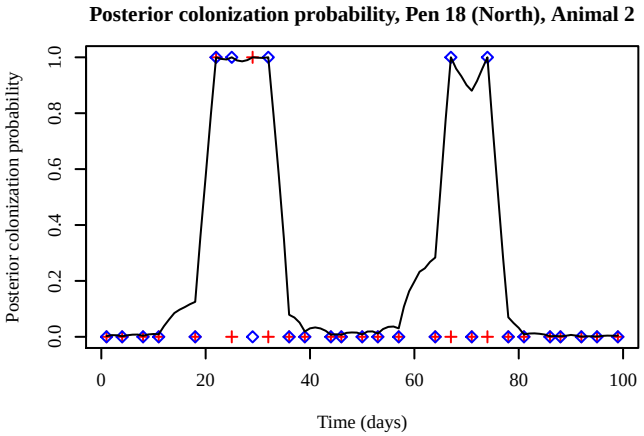

Posterior colonization probability, Pen 17 (North), Animal 5
Posterior colonization probability
Time (days)

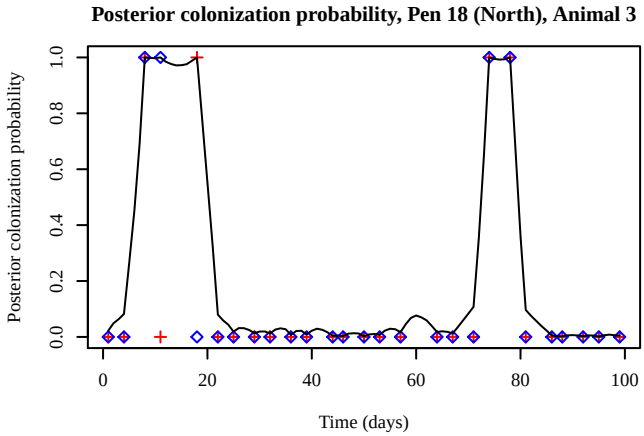

Posterior colonization probability, Pen 17 (North), Animal 6
Posterior colonization probability
Time (days)

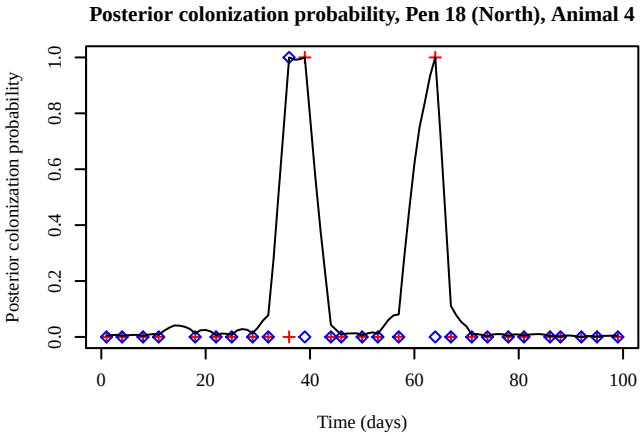

Posterior colonization probability, Pen 17 (North), Animal 7
Posterior colonization probability
Time (days)

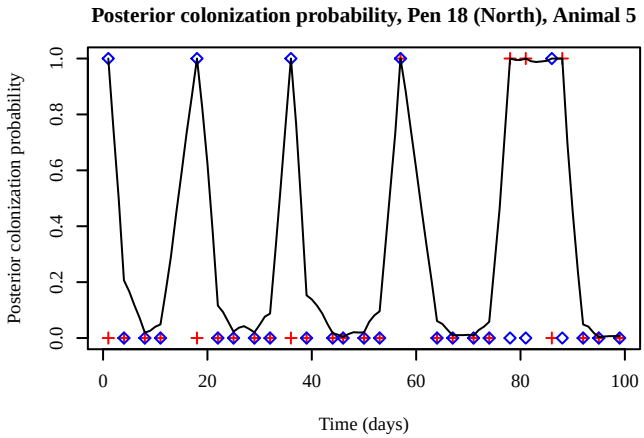

Posterior colonization probability, Pen 17 (North), Animal 8
Posterior colonization probability
Time (days)

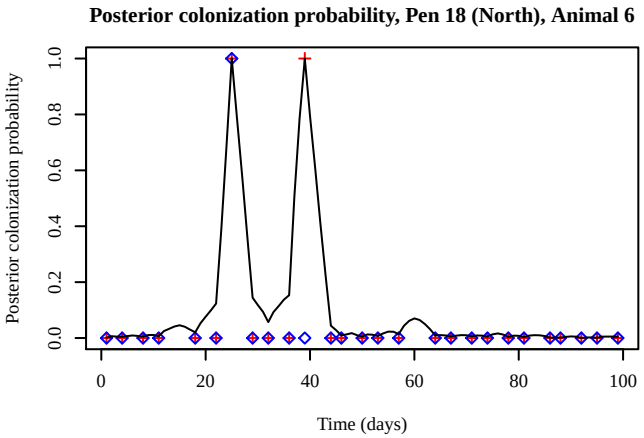

Posterior colonization probability, Pen 18 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

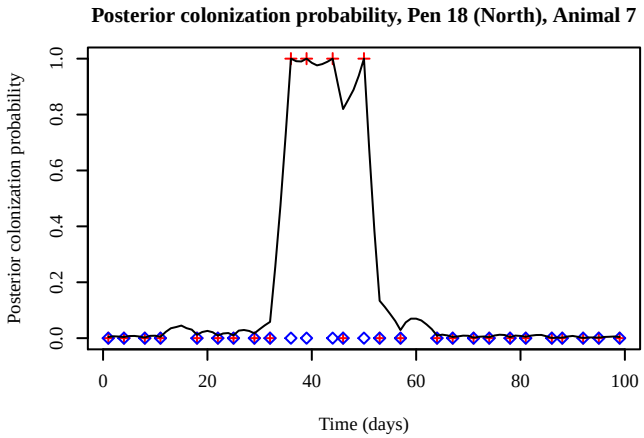

Posterior colonization probability, Pen 18 (North), Animal 2
Posterior colonization probability
Time (days)

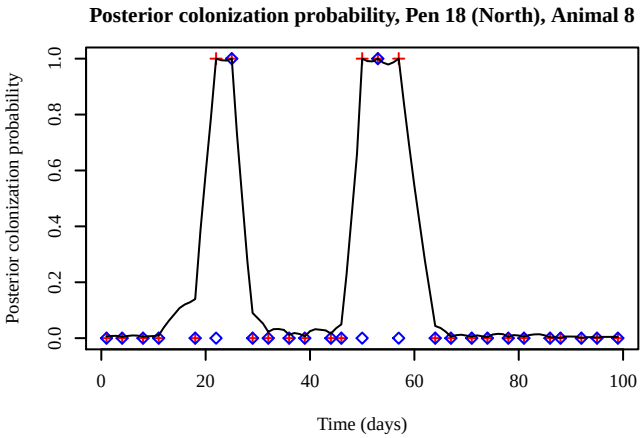

Posterior colonization probability, Pen 18 (North), Animal 3
Posterior colonization probability
Time (days)

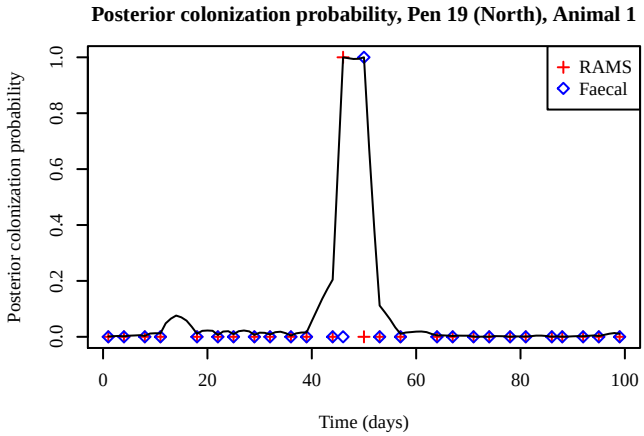

Posterior colonization probability, Pen 18 (North), Animal 4
Posterior colonization probability
Time (days)

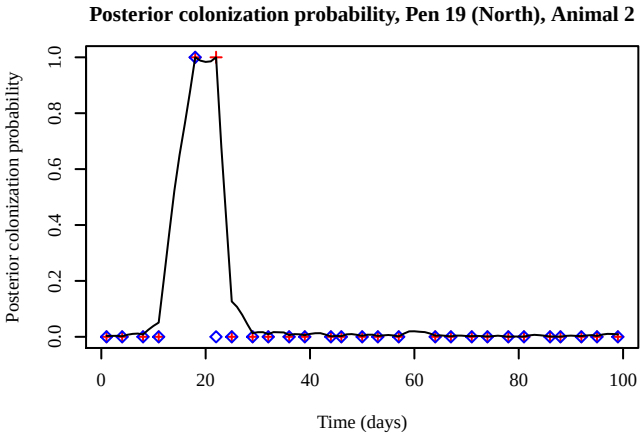

Posterior colonization probability, Pen 18 (North), Animal 5
Posterior colonization probability
Time (days)

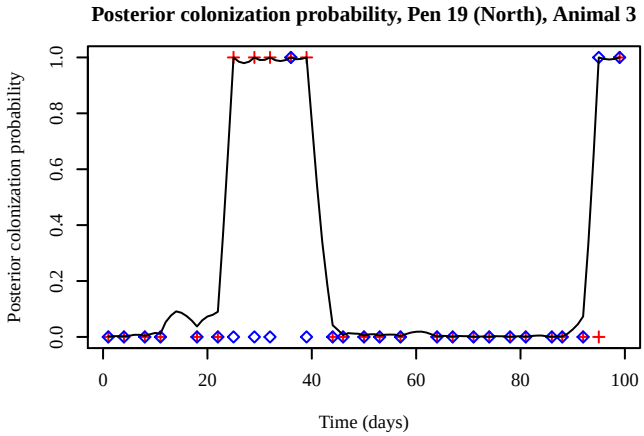

Posterior colonization probability, Pen 18 (North), Animal 6
Posterior colonization probability
Time (days)

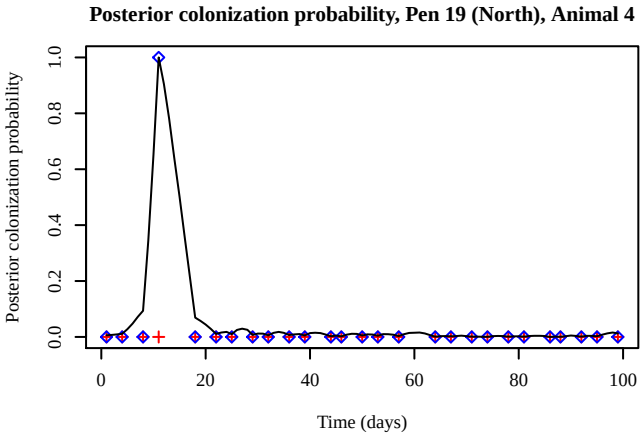

Posterior colonization probability, Pen 18 (North), Animal 7
Posterior colonization probability
Time (days)

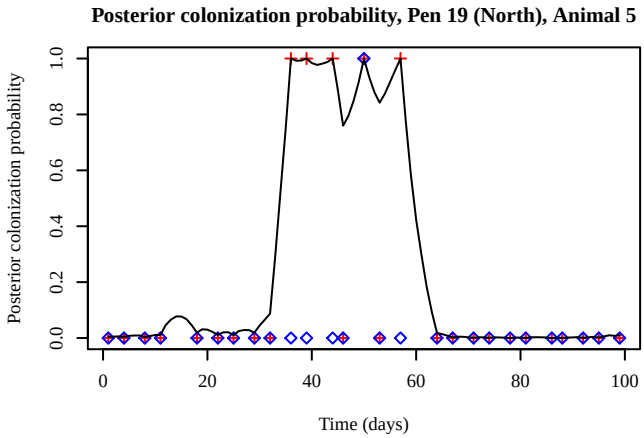

Posterior colonization probability, Pen 18 (North), Animal 8
Posterior colonization probability
Time (days)

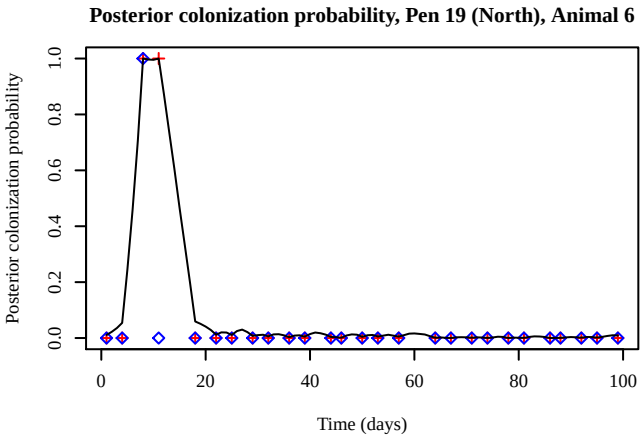

Posterior colonization probability, Pen 19 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

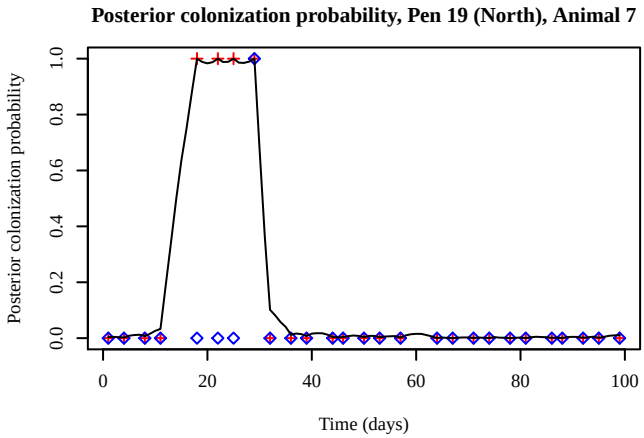

Posterior colonization probability, Pen 19 (North), Animal 2
Posterior colonization probability
Time (days)

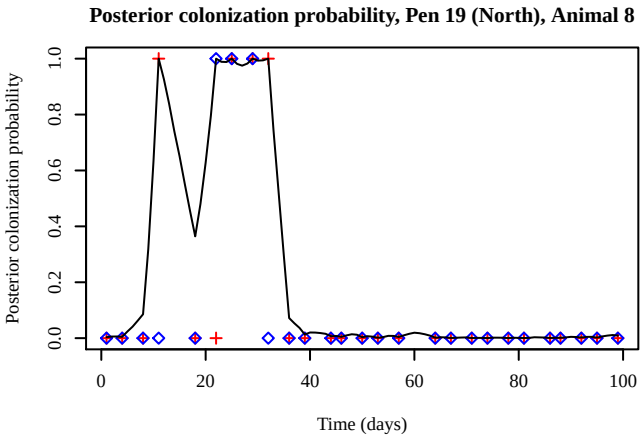

Posterior colonization probability, Pen 19 (North), Animal 3
Posterior colonization probability
Time (days)

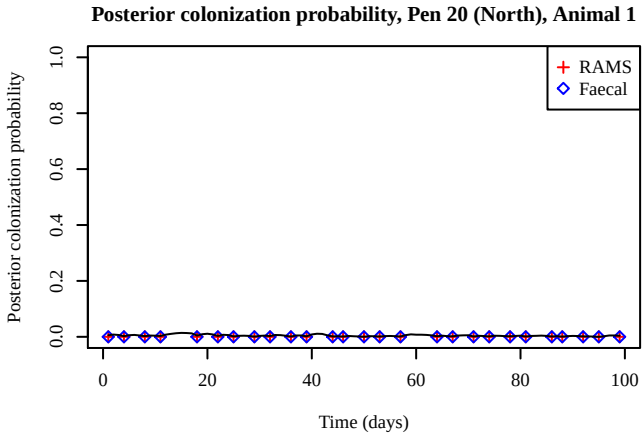

Posterior colonization probability, Pen 19 (North), Animal 4
Posterior colonization probability
Time (days)

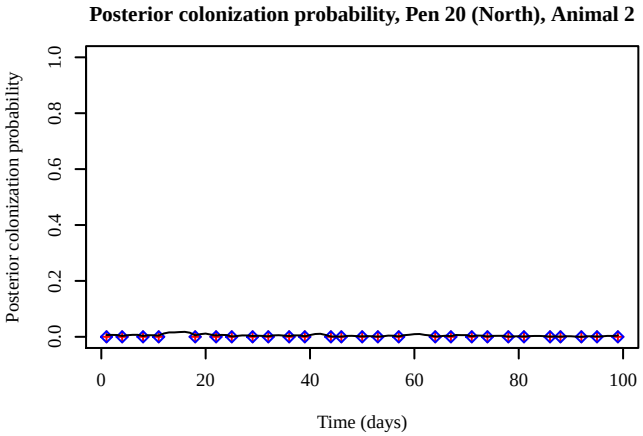

Posterior colonization probability, Pen 19 (North), Animal 5
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 19 (North), Animal 6
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 19 (North), Animal 7
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 19 (North), Animal 8
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 1
RAMS
Faecal
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 2
Posterior colonization probability
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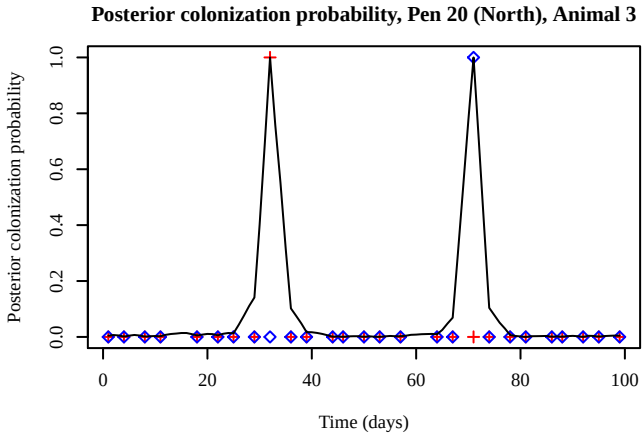
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 3
Posterior colonization probability
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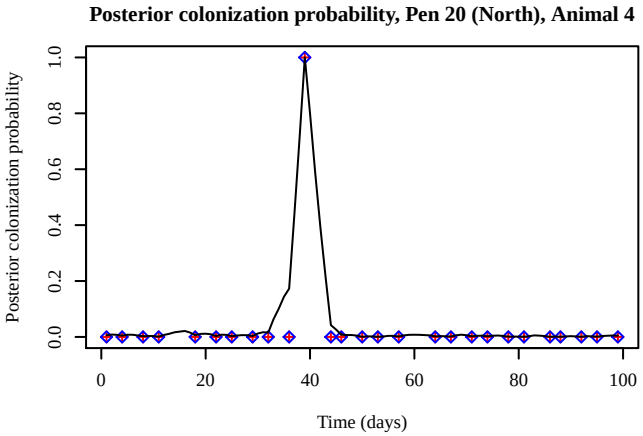
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 4
Posterior colonization probability
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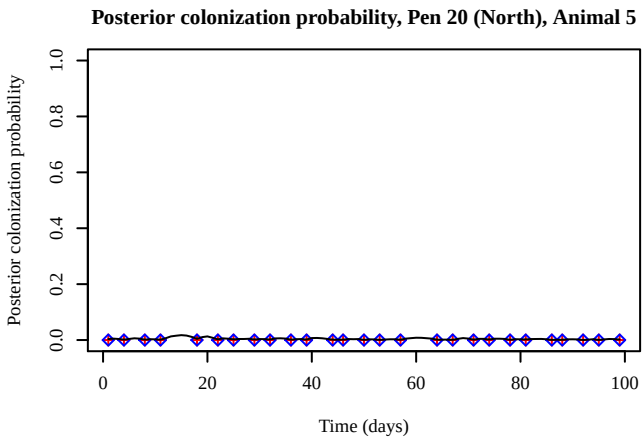
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 5
Posterior colonization probability
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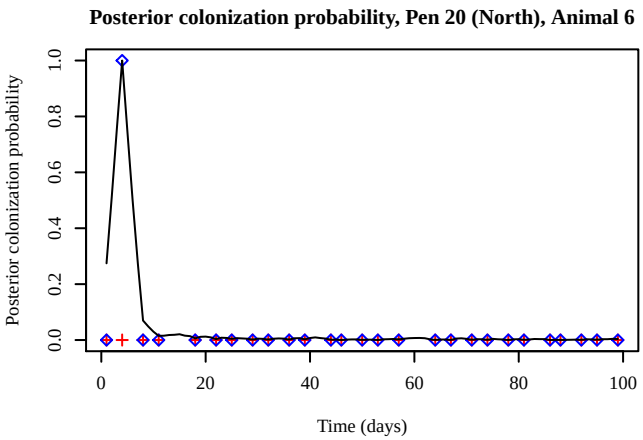
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 6
Posterior colonization probability
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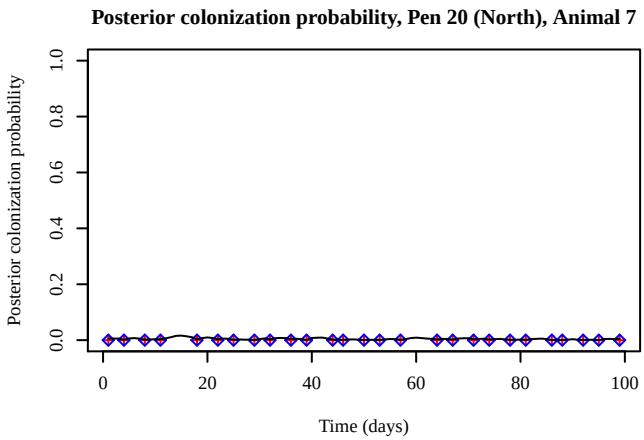
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 7
Posterior colonization probability
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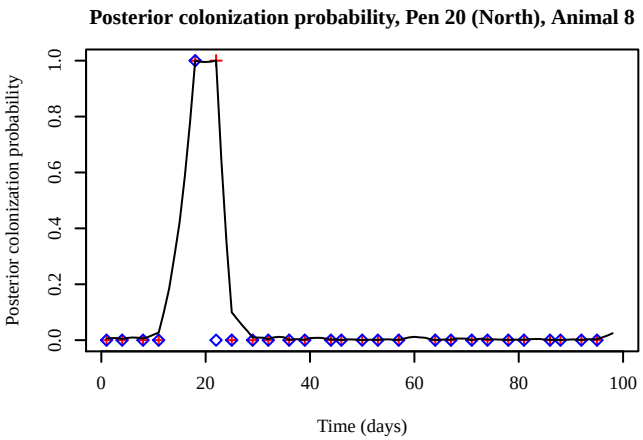
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 20 (North), Animal 8
Posterior colonization probability
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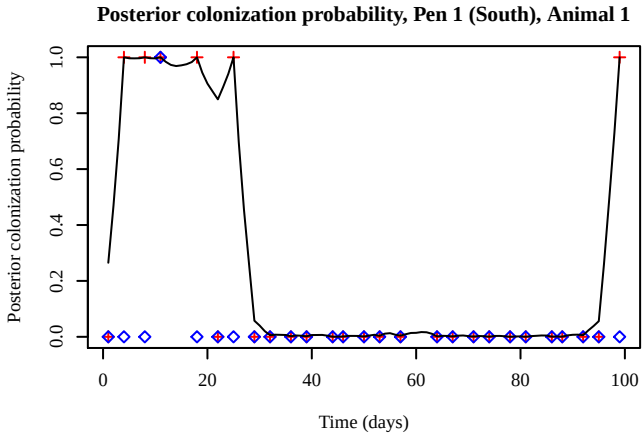
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 1
Posterior colonization probability
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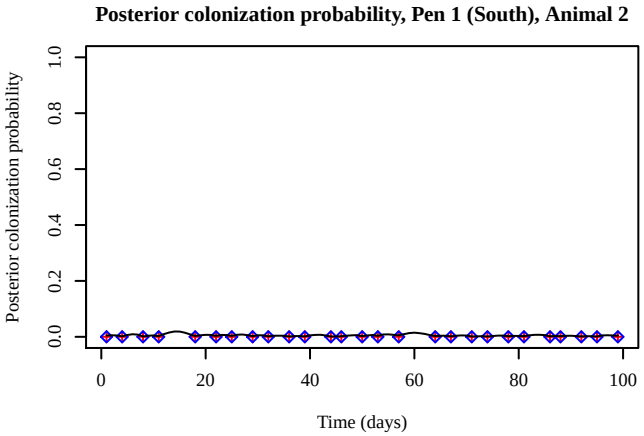
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 2
Posterior colonization probability
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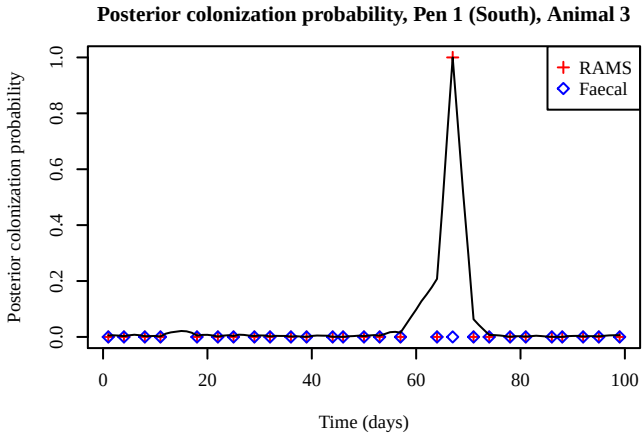
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 3
RAMS
Faecal
Posterior colonization probability
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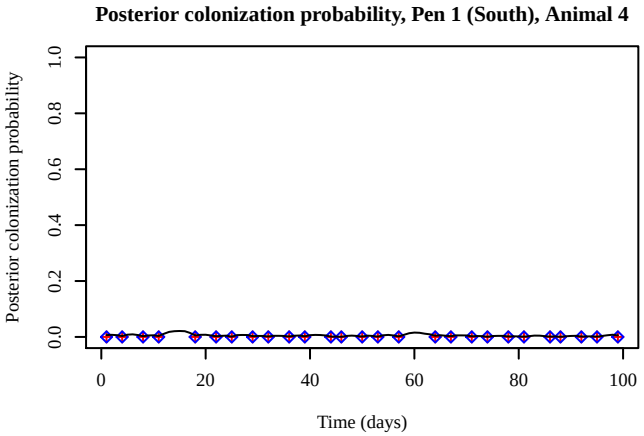
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 4
Posterior colonization probability
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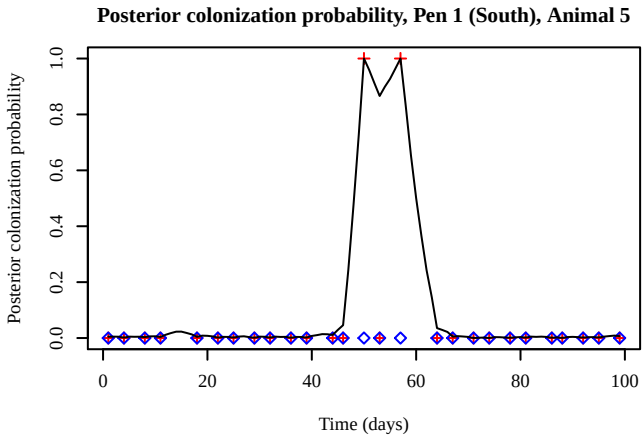
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 5
Posterior colonization probability
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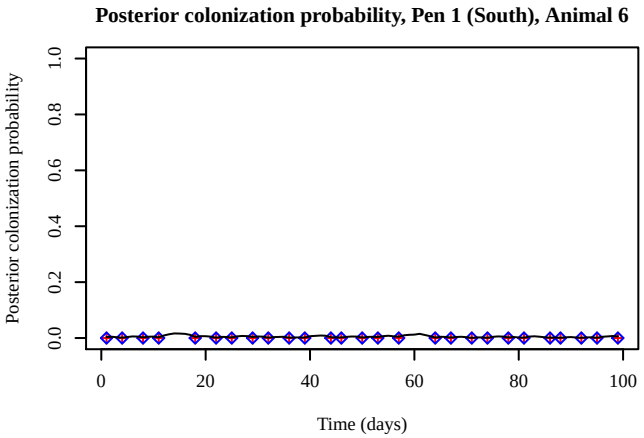
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 6
Posterior colonization probability
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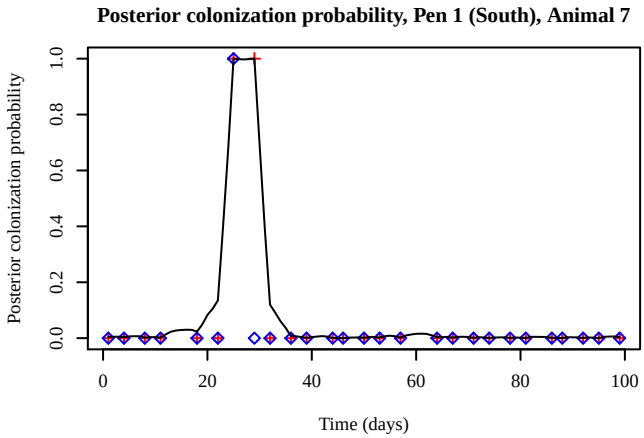
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 7
Posterior colonization probability
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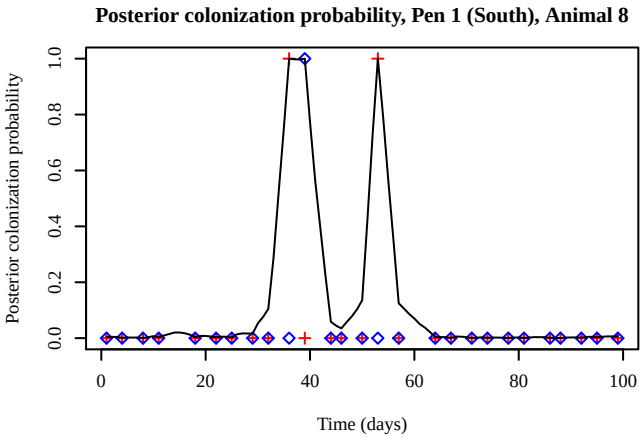
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 1 (South), Animal 8
Posterior colonization probability
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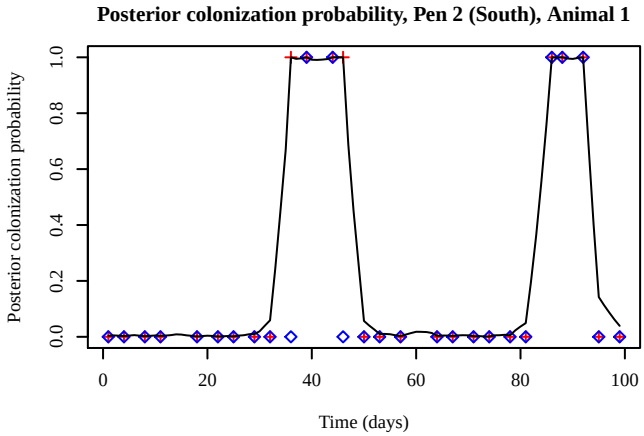
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 1
Posterior colonization probability
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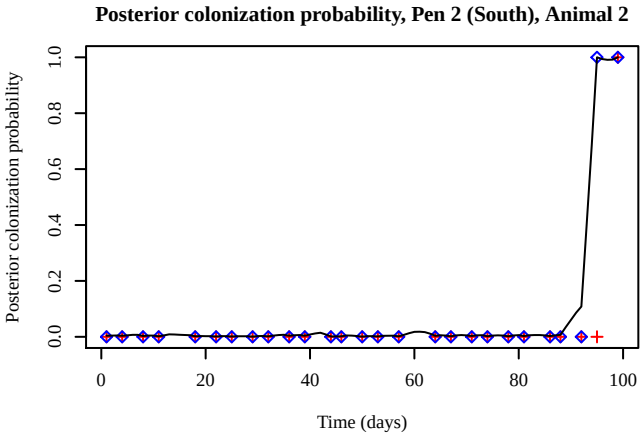
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 2
Posterior colonization probability
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0.4
0.6
0.8
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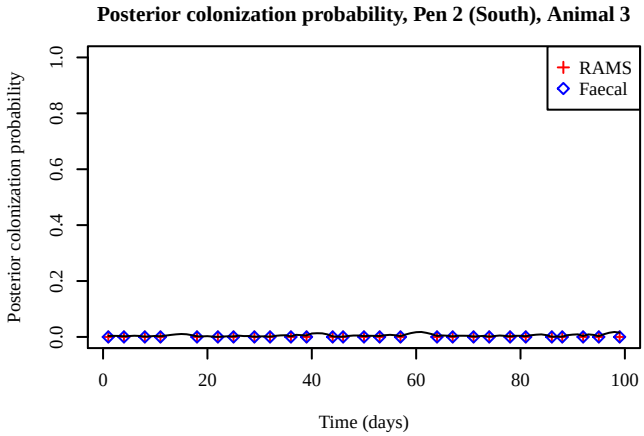
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 3
RAMS
Faecal
Posterior colonization probability
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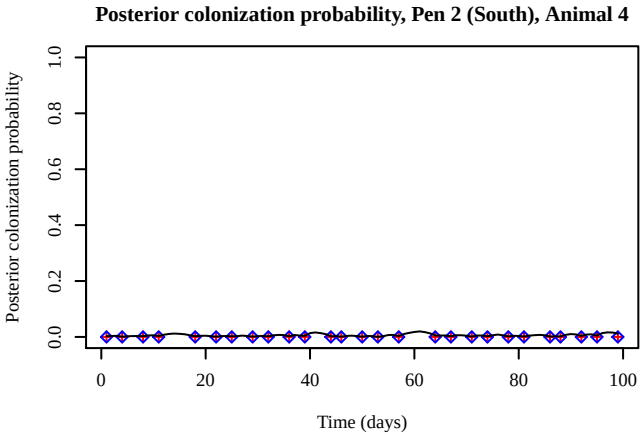
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 4
Posterior colonization probability
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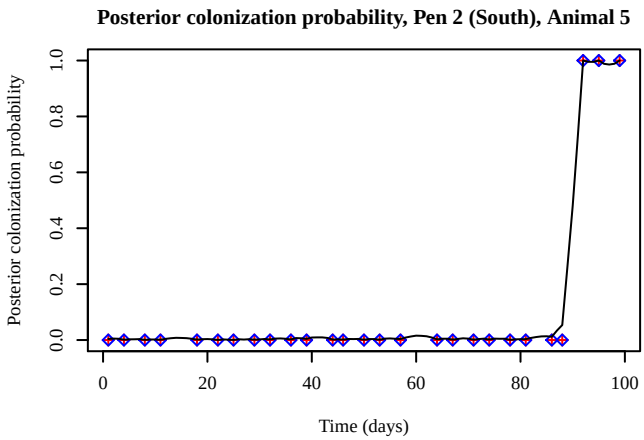
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 5
Posterior colonization probability
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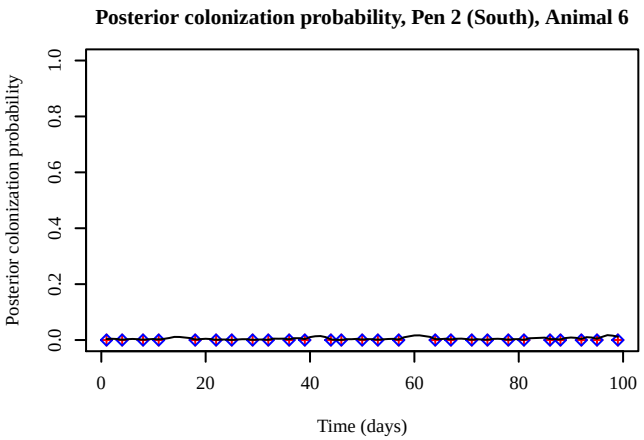
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 6
Posterior colonization probability
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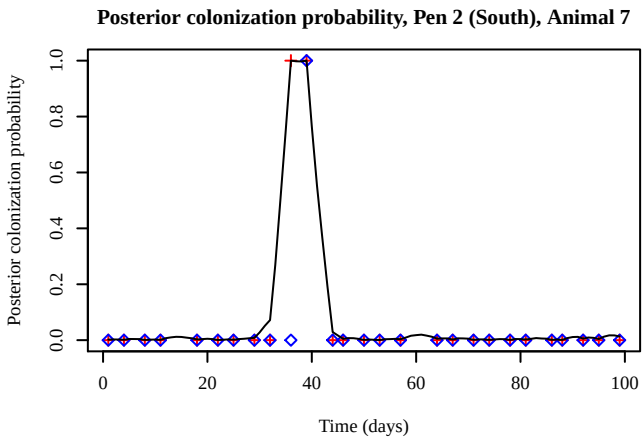
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 7
Posterior colonization probability
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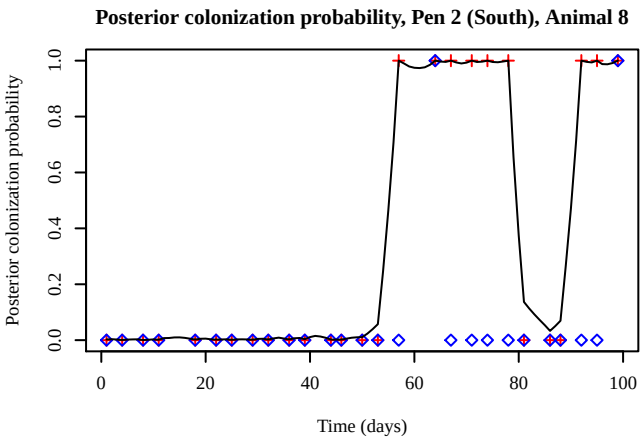
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 2 (South), Animal 8
Posterior colonization probability
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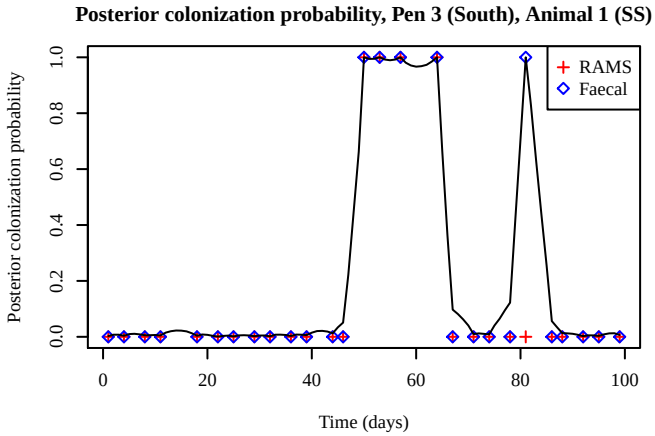
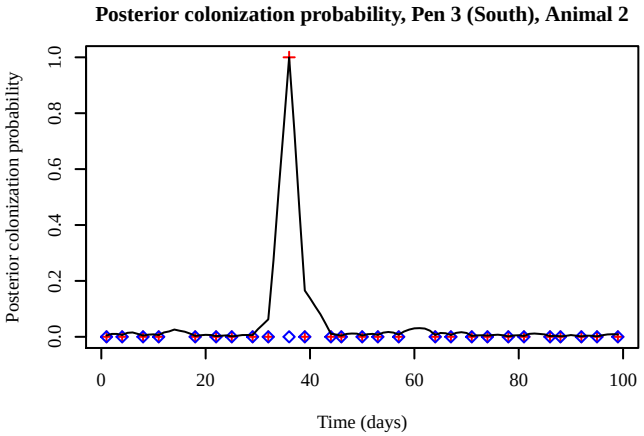
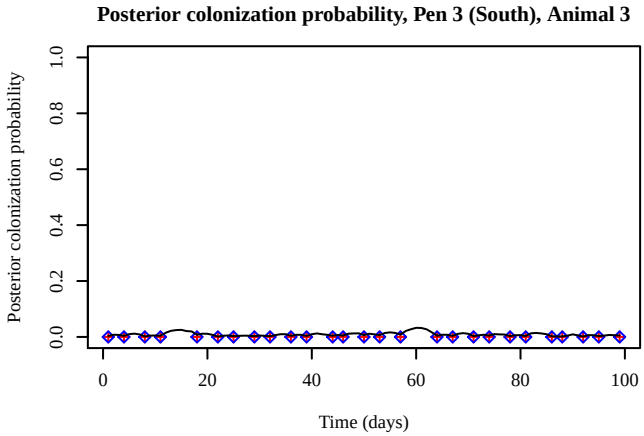
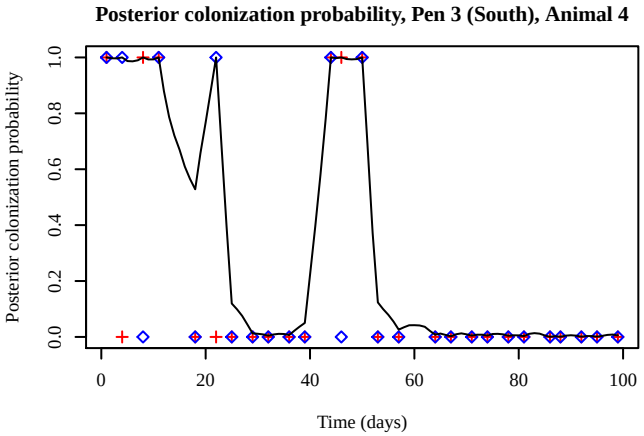
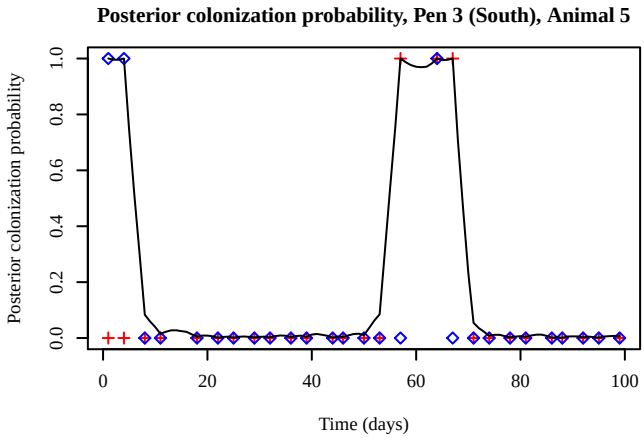
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

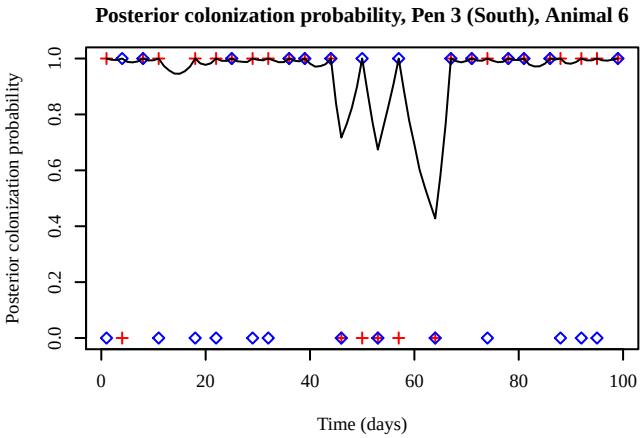

Posterior colonization probability, Pen 3 (South), Animal 1 (SS)
RAMS
Faecal
Posterior colonization probability
Time (days)

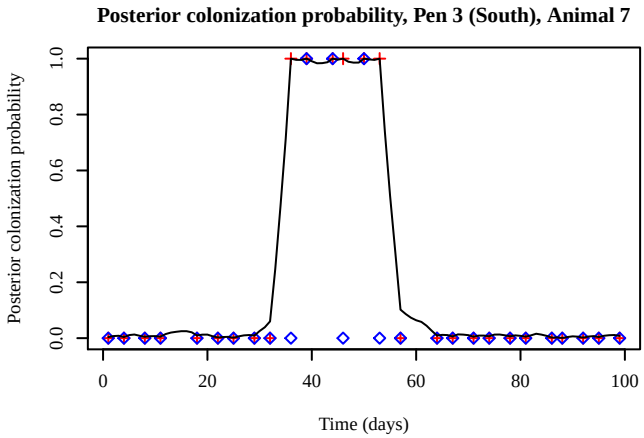

Posterior colonization probability, Pen 3 (South), Animal 2
Posterior colonization probability
Time (days)

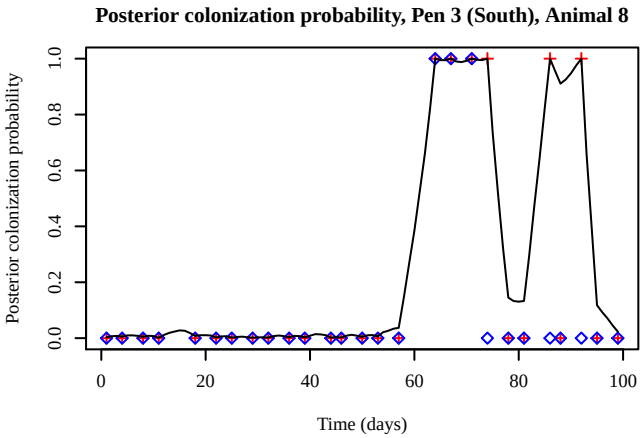

Posterior colonization probability, Pen 3 (South), Animal 3
Posterior colonization probability
Time (days)

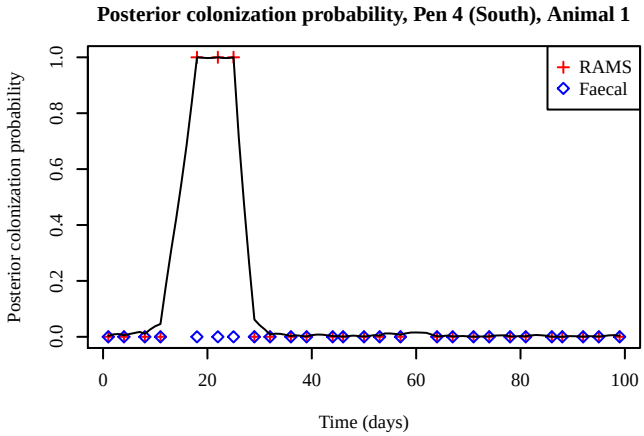

Posterior colonization probability, Pen 3 (South), Animal 4
Posterior colonization probability
Time (days)

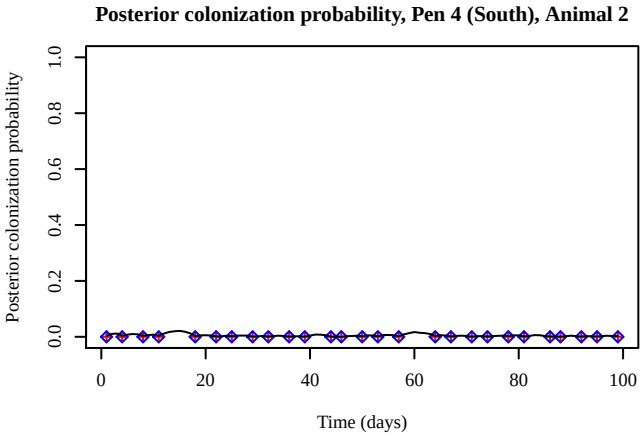

Posterior colonization probability, Pen 3 (South), Animal 5
Posterior colonization probability
Time (days)

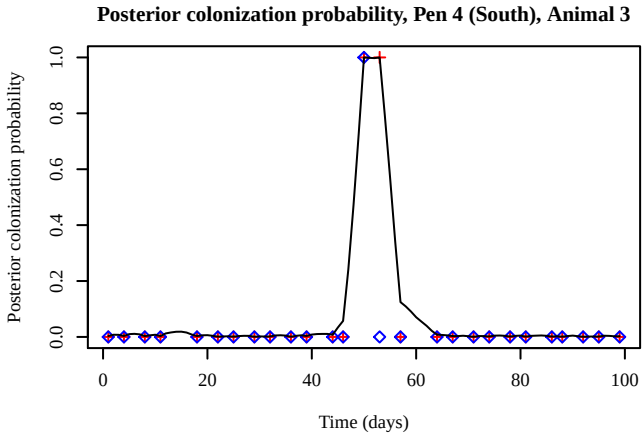

Posterior colonization probability, Pen 3 (South), Animal 6
Posterior colonization probability
Time (days)

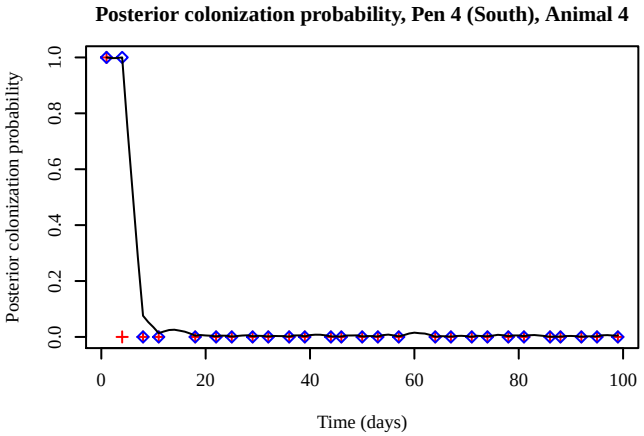

Posterior colonization probability, Pen 3 (South), Animal 7
Posterior colonization probability
Time (days)

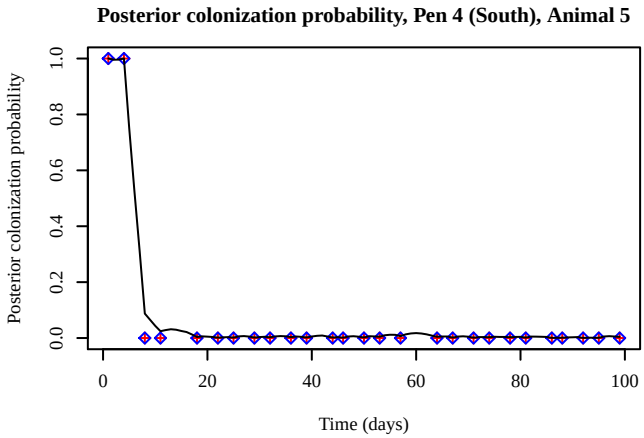

Posterior colonization probability, Pen 3 (South), Animal 8
Posterior colonization probability
Time (days)

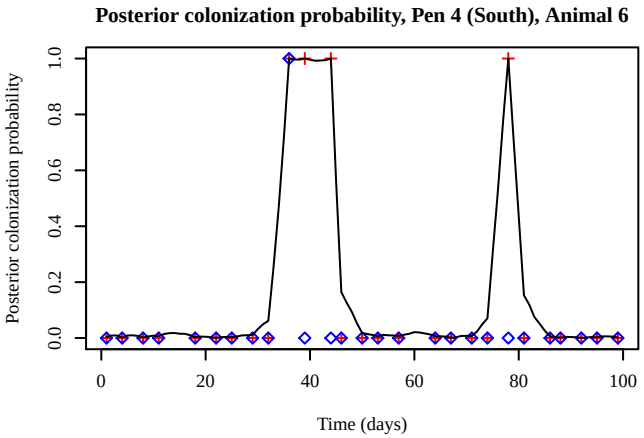

Posterior colonization probability, Pen 4 (South), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

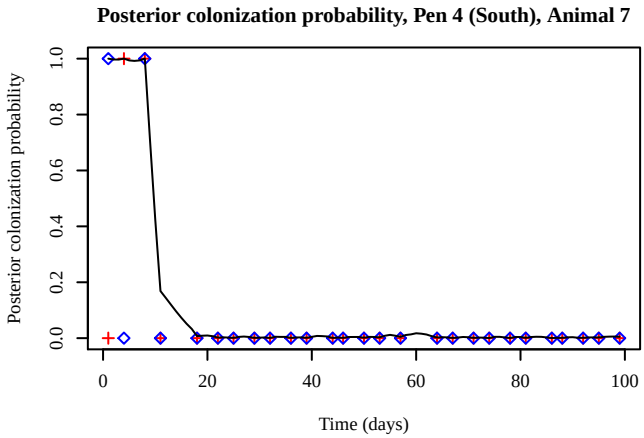

Posterior colonization probability, Pen 4 (South), Animal 2
Posterior colonization probability
Time (days)

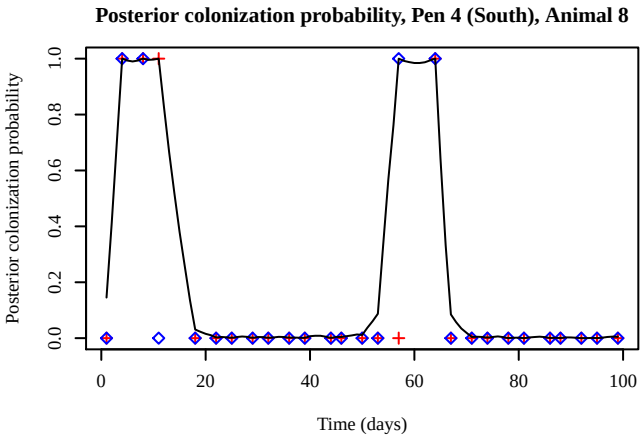

Posterior colonization probability, Pen 4 (South), Animal 3
Posterior colonization probability
Time (days)

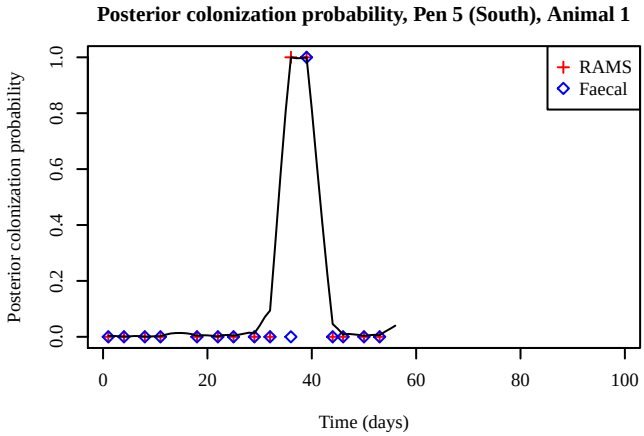

Posterior colonization probability, Pen 4 (South), Animal 4
Posterior colonization probability
Time (days)

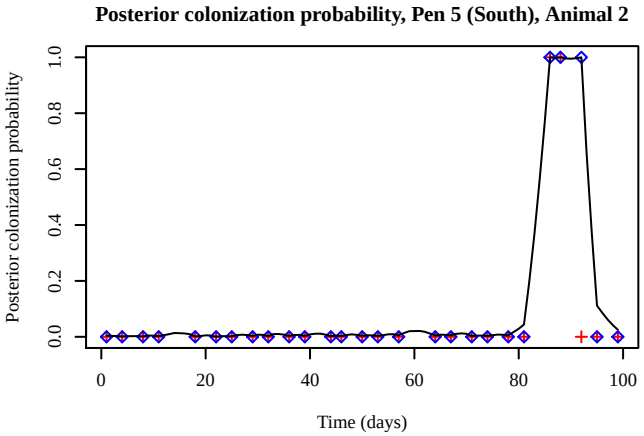

Posterior colonization probability, Pen 4 (South), Animal 5
Posterior colonization probability
Time (days)

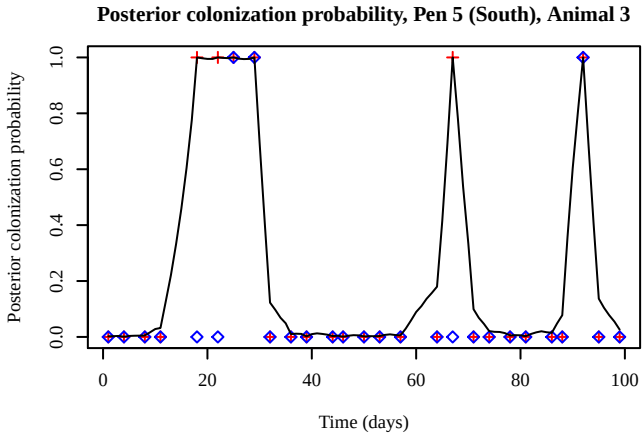

Posterior colonization probability, Pen 4 (South), Animal 6
Posterior colonization probability
Time (days)

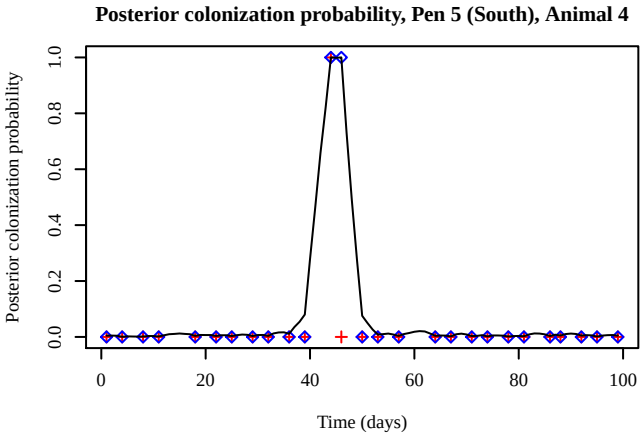

Posterior colonization probability, Pen 4 (South), Animal 7
Posterior colonization probability
Time (days)

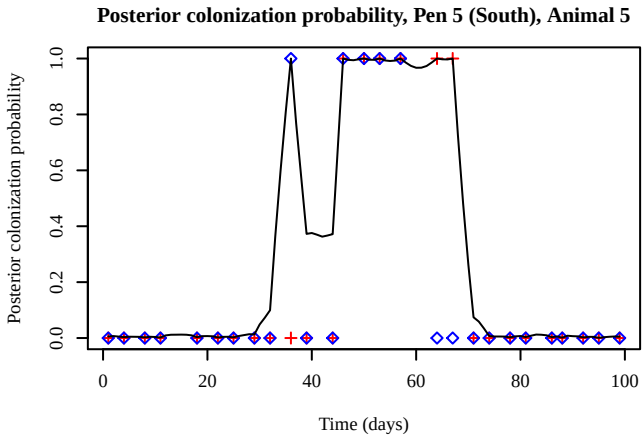

Posterior colonization probability, Pen 4 (South), Animal 8
Posterior colonization probability
Time (days)

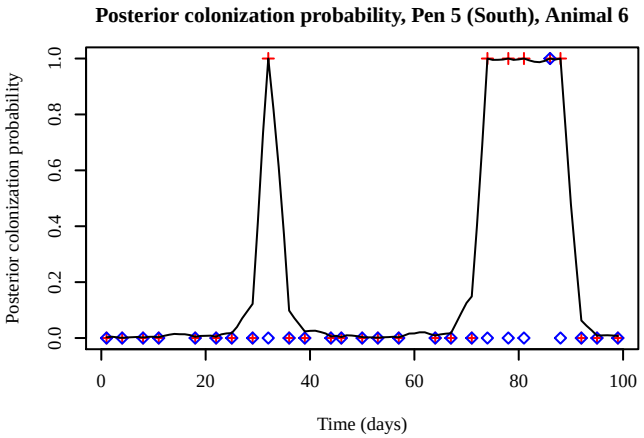

Posterior colonization probability, Pen 5 (South), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

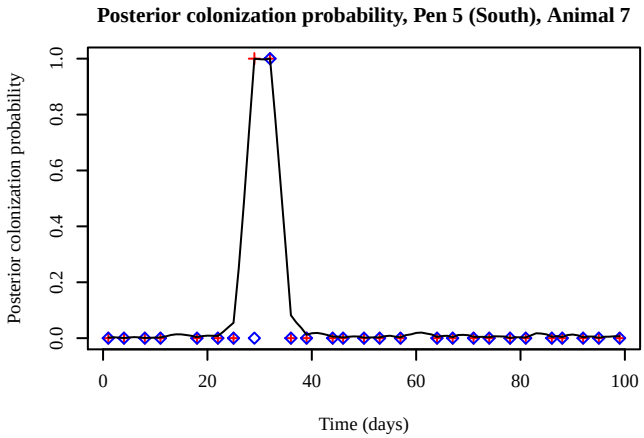

Posterior colonization probability, Pen 5 (South), Animal 2
Posterior colonization probability
Time (days)

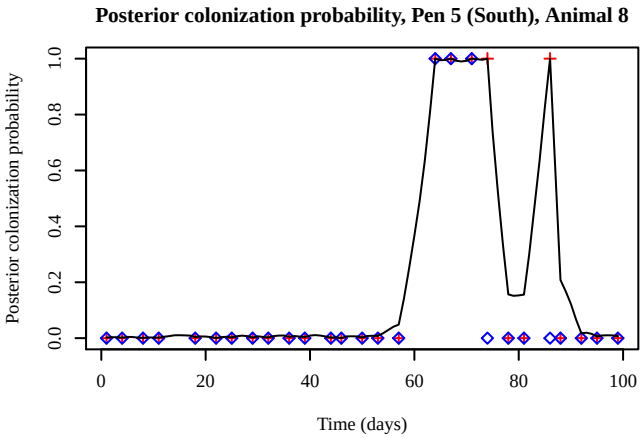

Posterior colonization probability, Pen 5 (South), Animal 3
Posterior colonization probability
Time (days)

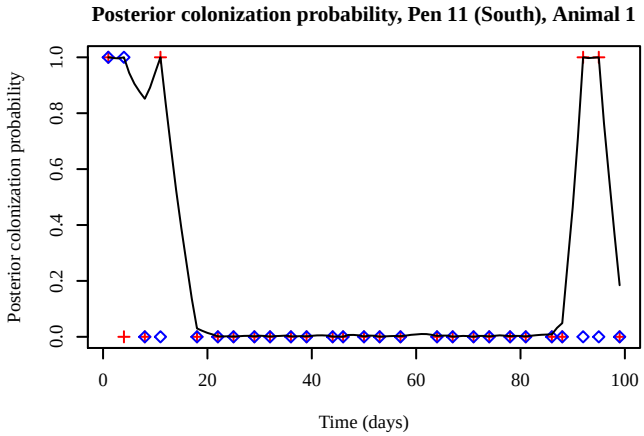

Posterior colonization probability, Pen 5 (South), Animal 4
Posterior colonization probability
Time (days)

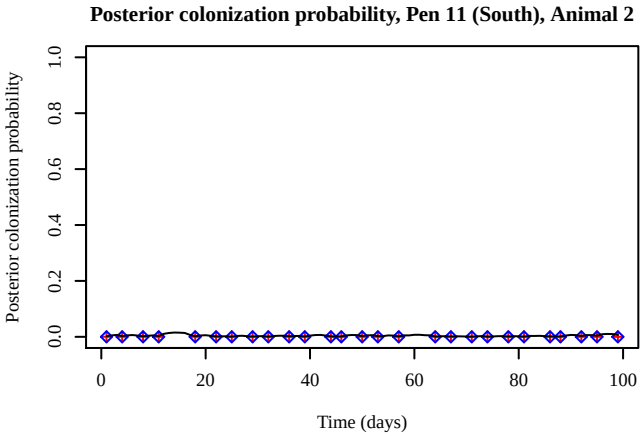

Posterior colonization probability, Pen 5 (South), Animal 5
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 5 (South), Animal 6
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 5 (South), Animal 7
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 5 (South), Animal 8
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 11 (South), Animal 1
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)


Posterior colonization probability, Pen 11 (South), Animal 2
Posterior colonization probability
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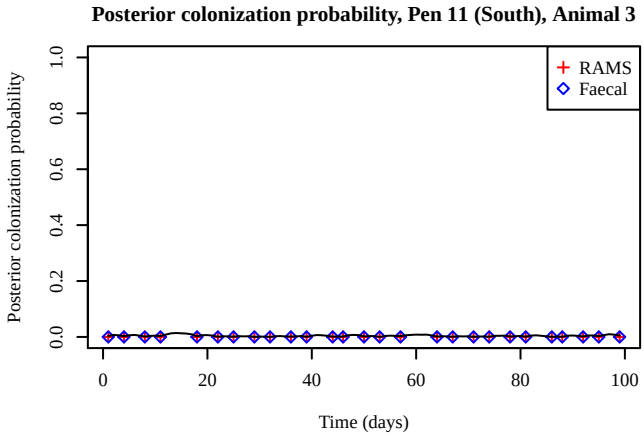
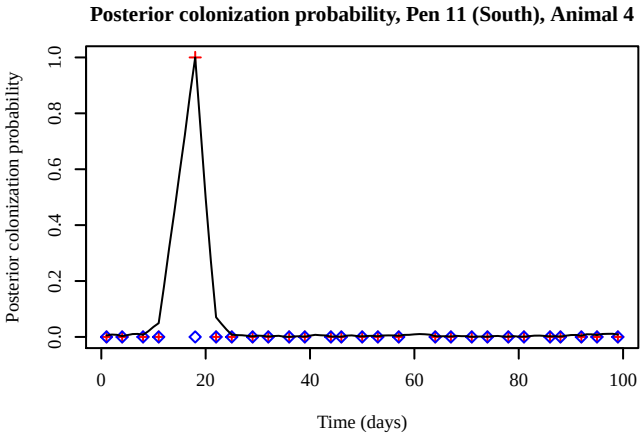
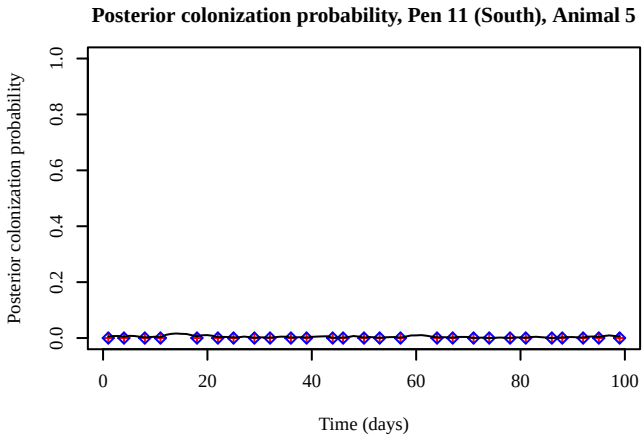
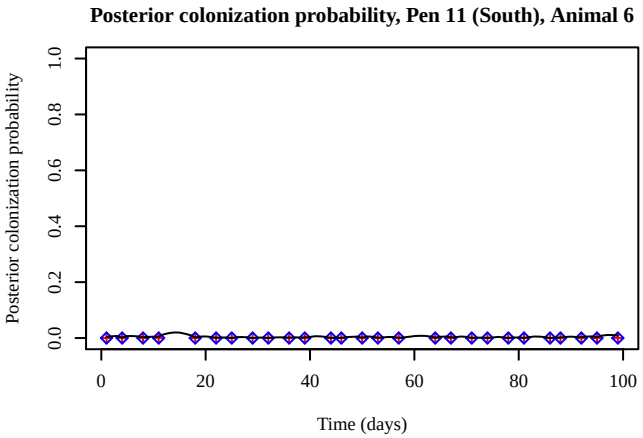
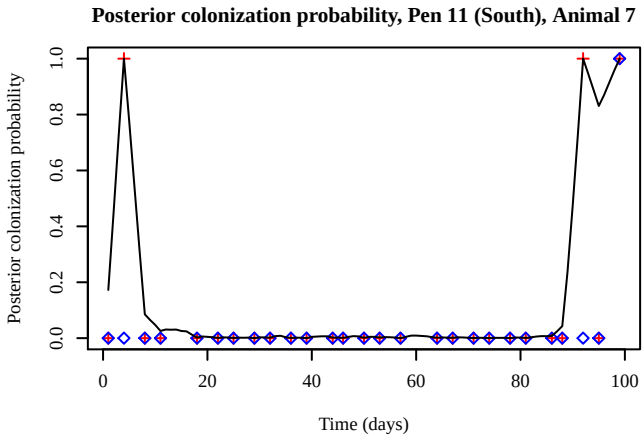
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

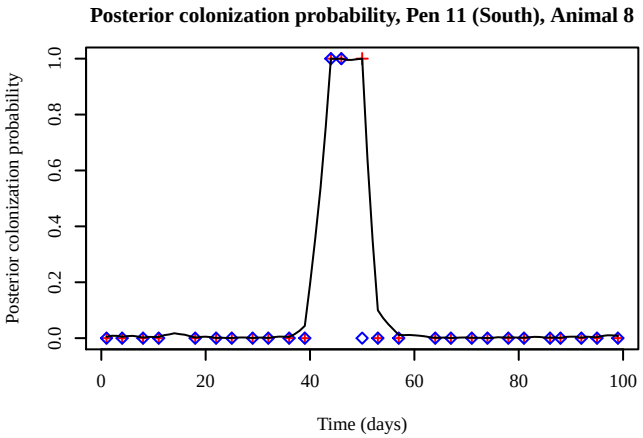

Posterior colonization probability, Pen 11 (South), Animal 3
RAMS
Faecal
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

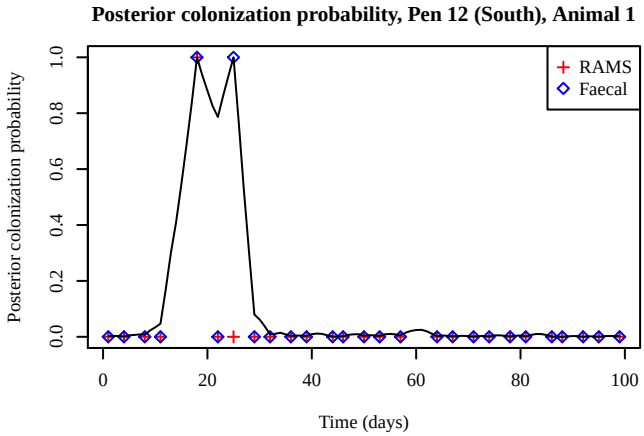

Posterior colonization probability, Pen 11 (South), Animal 4
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

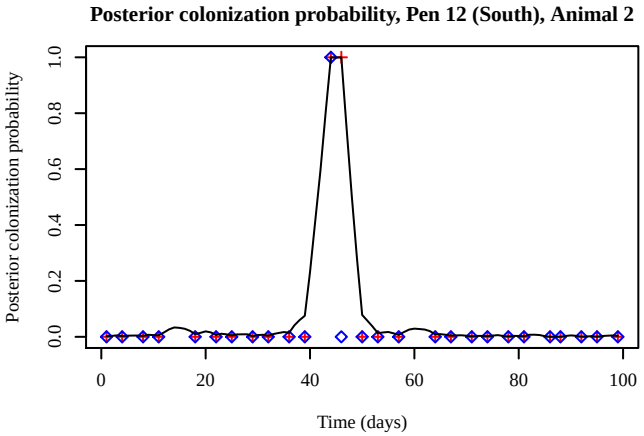

Posterior colonization probability, Pen 11 (South), Animal 5
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

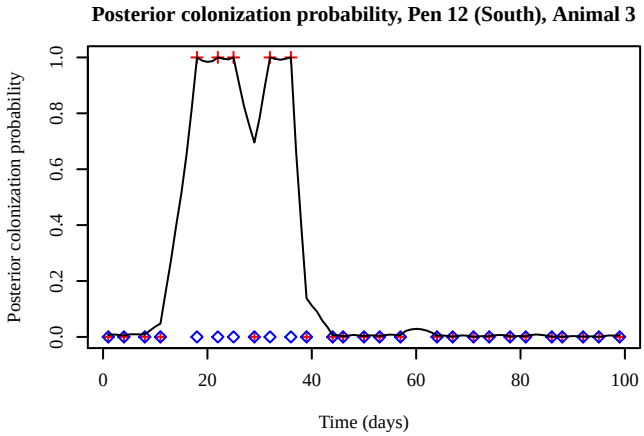

Posterior colonization probability, Pen 11 (South), Animal 6
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

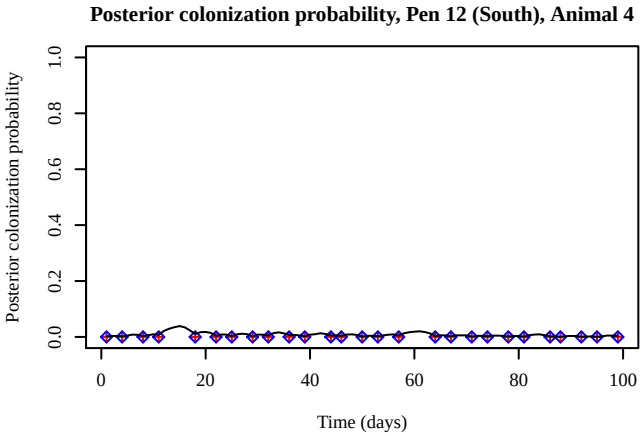

Posterior colonization probability, Pen 11 (South), Animal 7
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

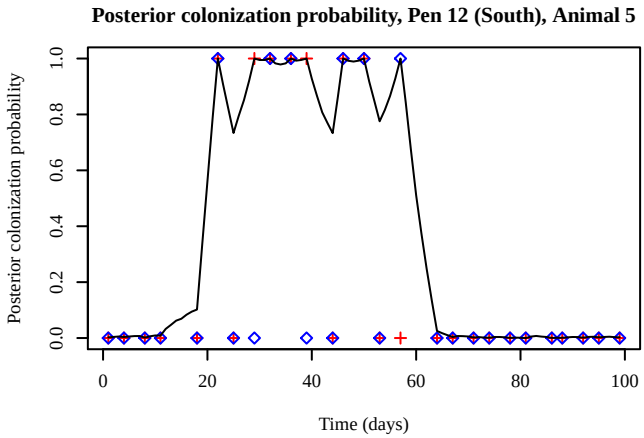

Posterior colonization probability, Pen 11 (South), Animal 8
Posterior colonization probability
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100
Time (days)

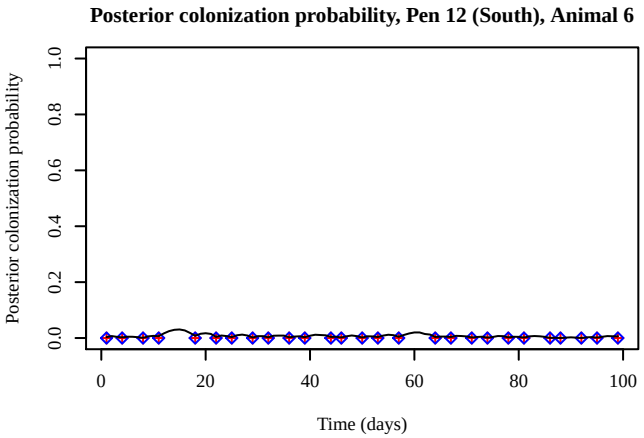

Posterior colonization probability, Pen 12 (South), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

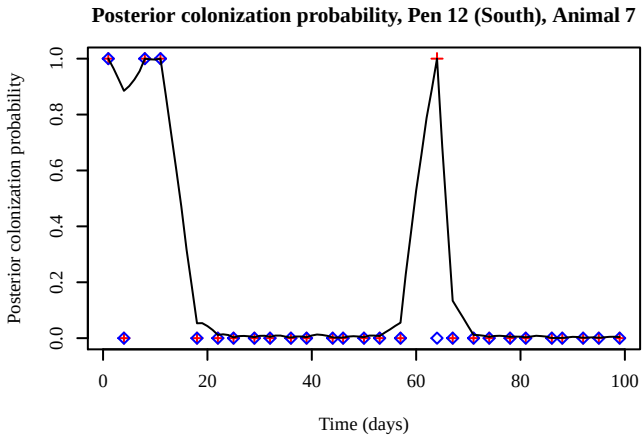

Posterior colonization probability, Pen 12 (South), Animal 2
Posterior colonization probability
Time (days)

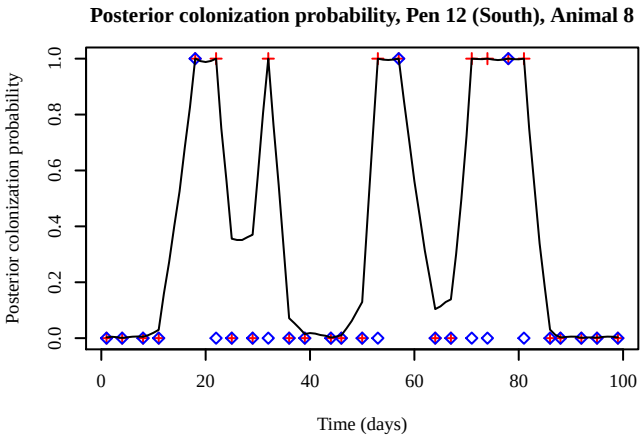

Posterior colonization probability, Pen 12 (South), Animal 3
Posterior colonization probability
Time (days)

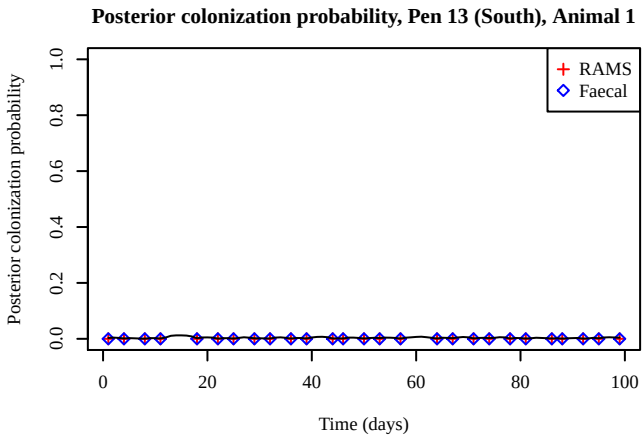

Posterior colonization probability, Pen 12 (South), Animal 4
Posterior colonization probability
Time (days)

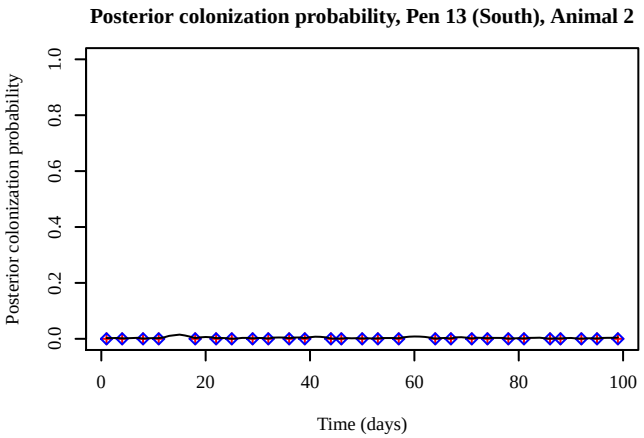

Posterior colonization probability, Pen 12 (South), Animal 5
Posterior colonization probability
Time (days)

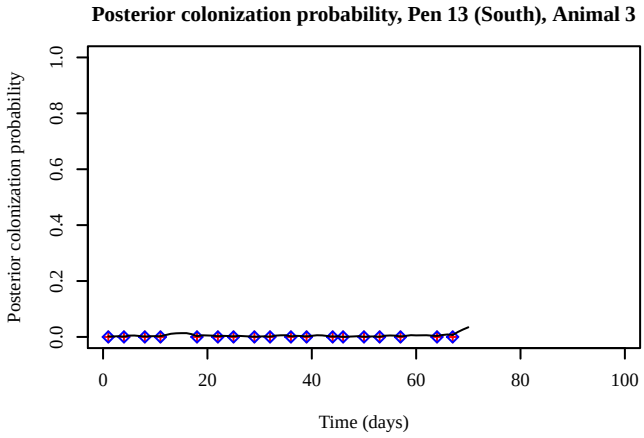

Posterior colonization probability, Pen 12 (South), Animal 6
Posterior colonization probability
Time (days)

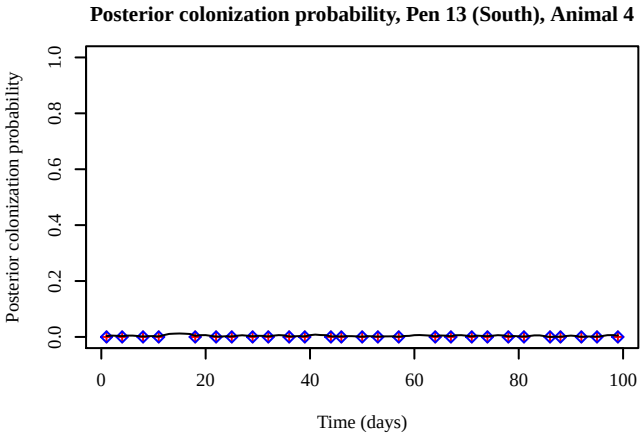

Posterior colonization probability, Pen 12 (South), Animal 7
Posterior colonization probability
Time (days)

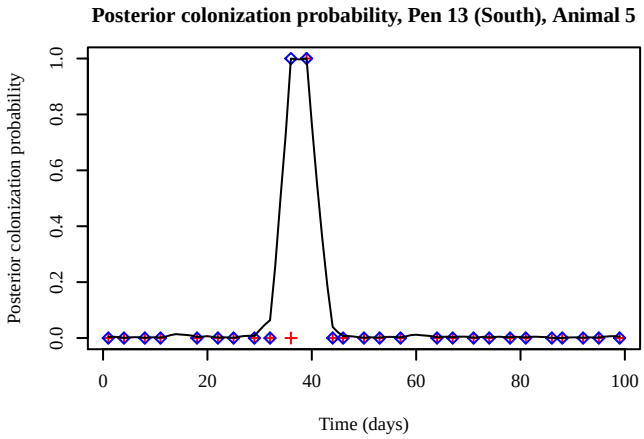

Posterior colonization probability, Pen 12 (South), Animal 8
Posterior colonization probability
Time (days)

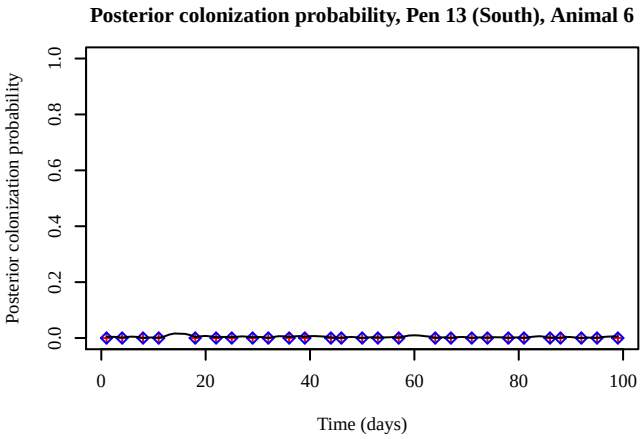

Posterior colonization probability, Pen 13 (South), Animal 1
RAMS
Faecal
Posterior colonization probability
Time (days)

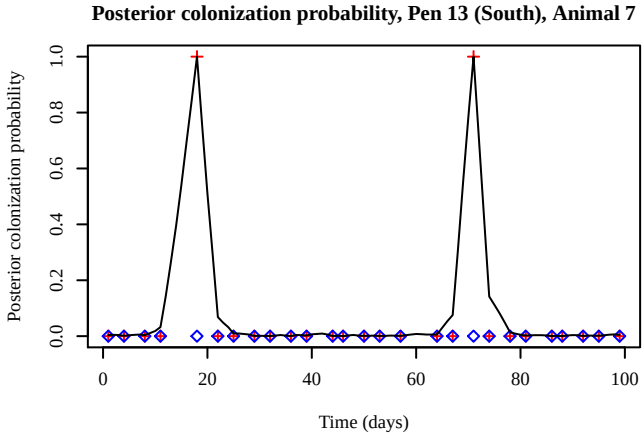

Posterior colonization probability, Pen 13 (South), Animal 2
Posterior colonization probability
Time (days)

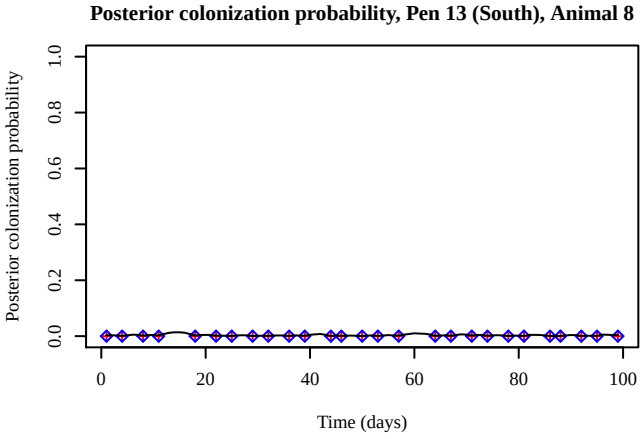

Posterior colonization probability, Pen 13 (South), Animal 3
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 13 (South), Animal 4
Posterior colonization probability
Time (days)


Posterior colonization probability, Pen 13 (South), Animal 5
Posterior colonization probability
Time (days)

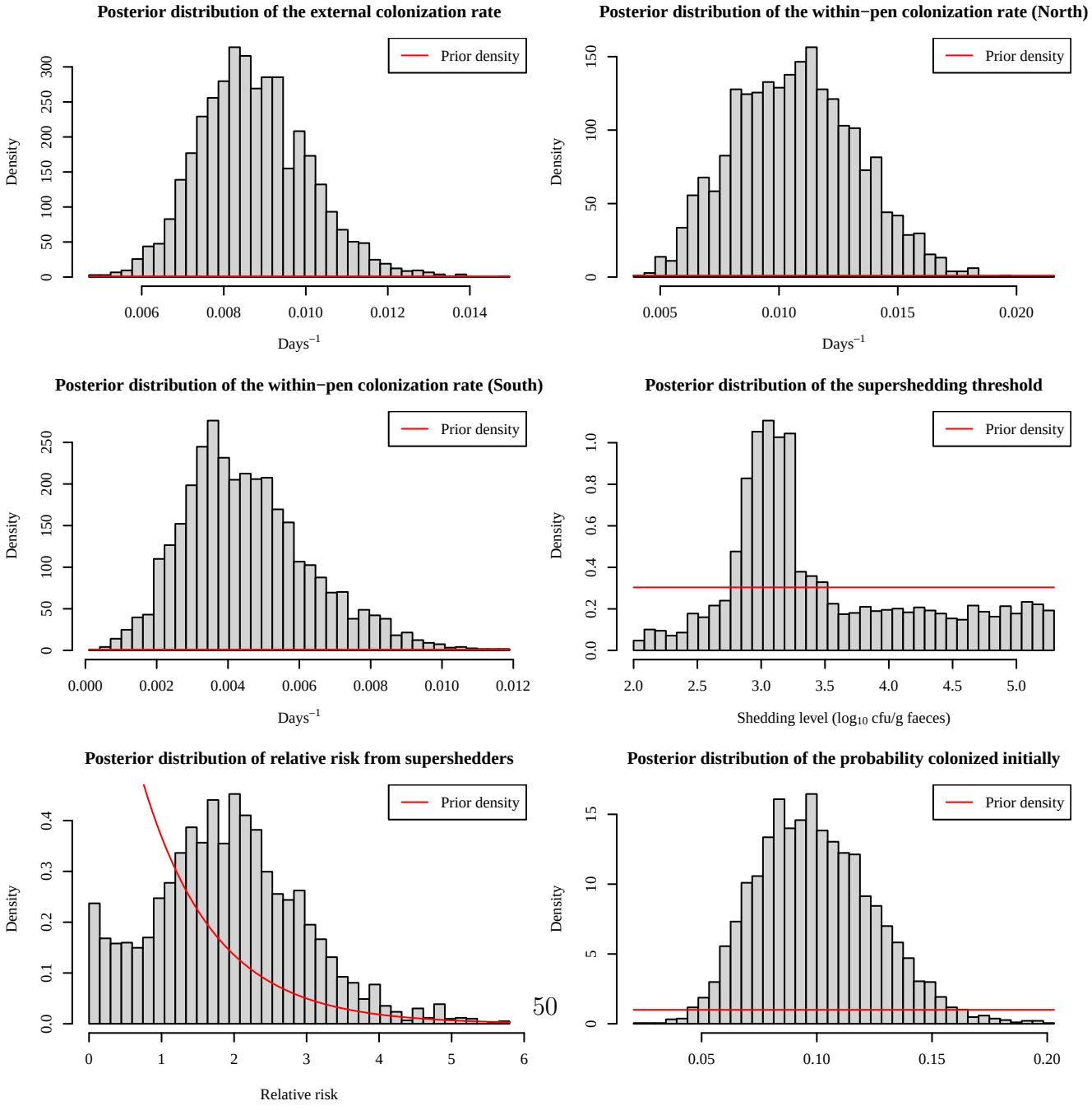

Posterior colonization probability, Pen 13 (South), Animal 6
Posterior colonization probability
Time (days)

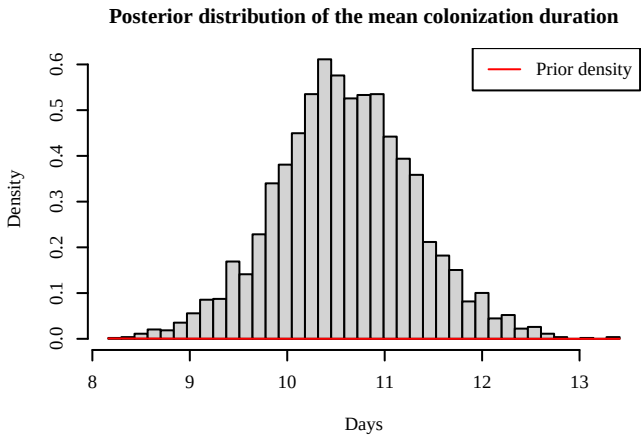

Posterior colonization probability, Pen 13 (South), Animal 7
Posterior colonization probability
Time (days)

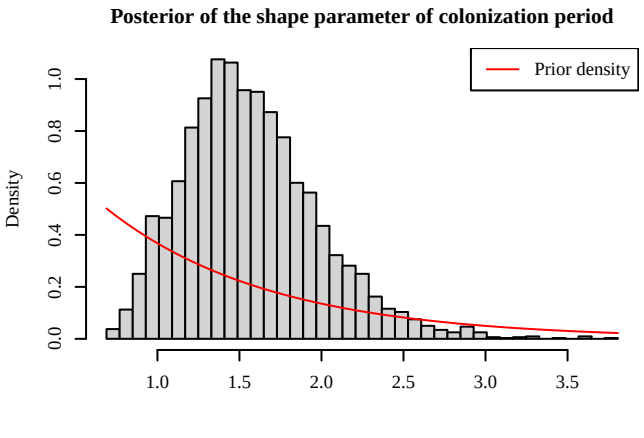

Posterior colonization probability, Pen 13 (South), Animal 8
Posterior colonization probability
Time (days)

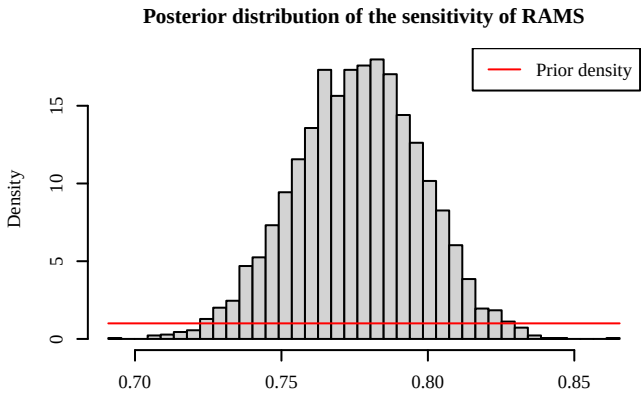
5 Parameter posteriors

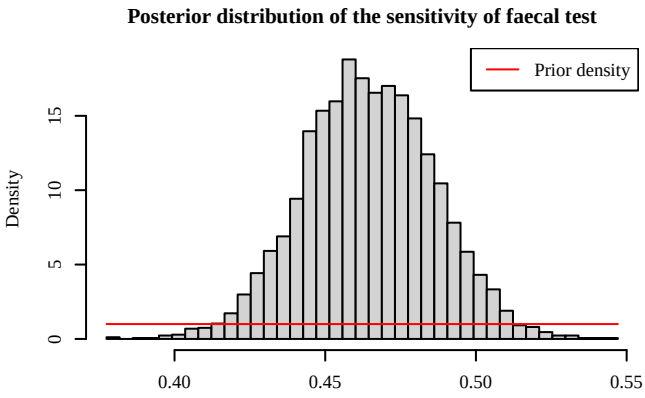
Posterior distributions for the parameters of the model described in Main Text Section 2.5. In this model the value of the supershedding threshold τ was inferred from the data. The final two plots show the joint posterior distribution of the supershedding threshold τ and the relative risk from supershedders ρ – the first shows the posterior samples whilst the second shows a 2-dimensional Kernel Density Estimate (KDE).

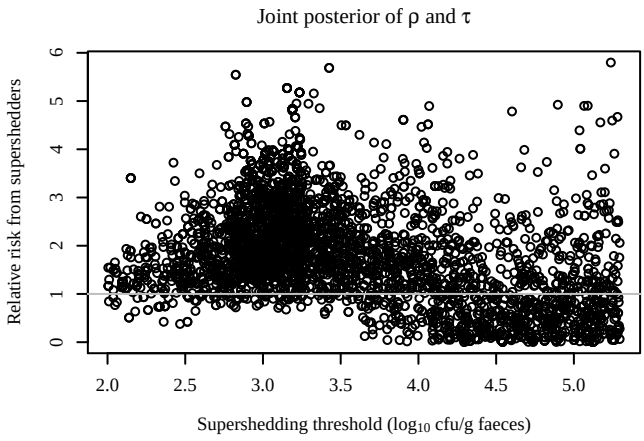


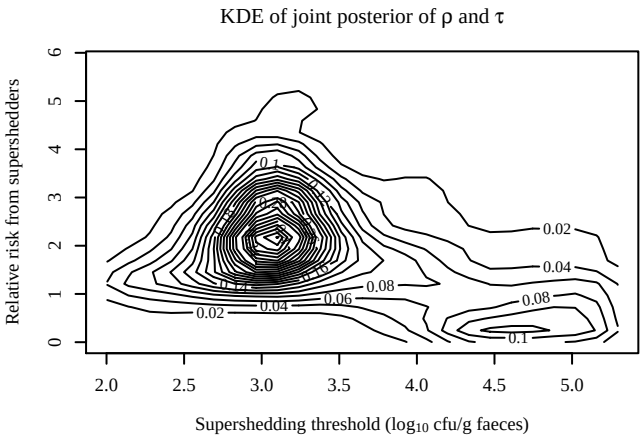

Posterior distribution of the mean colonization duration
Prior density
Density
Days


Posterior of the shape parameter of colonization period
Prior density
Density


Posterior distribution of the sensitivity of RAMS
Prior density
Density

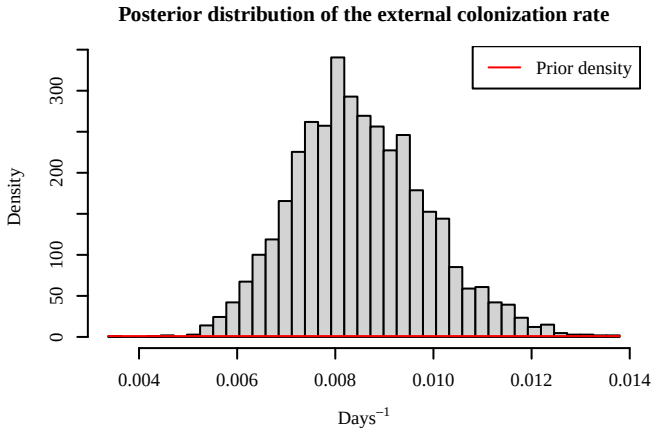

Posterior distribution of the sensitivity of faecal test
Prior density
Density

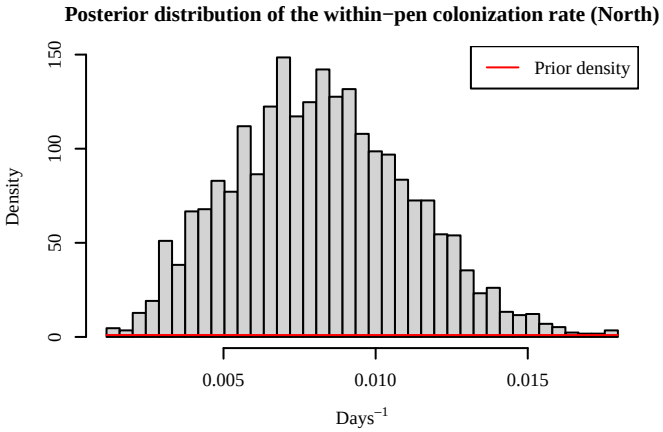

Joint posterior of ρ and τ
Relative risk from supershedders
Supershedding threshold (log10 cfu/g faeces)

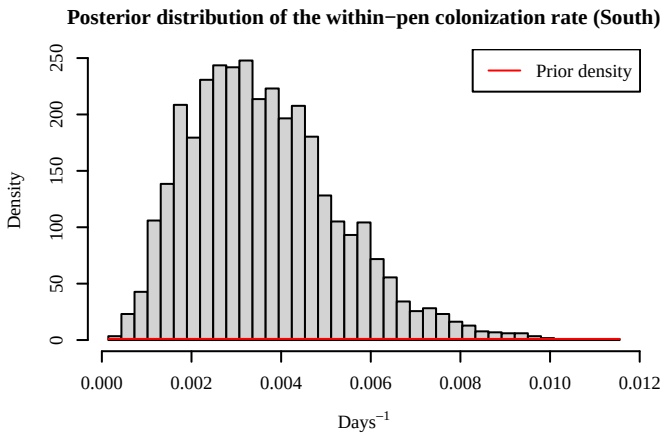

KDE of joint posterior of ρ and τ
Relative risk from supershedders
Supershedding threshold (log10 cfu/g faeces)

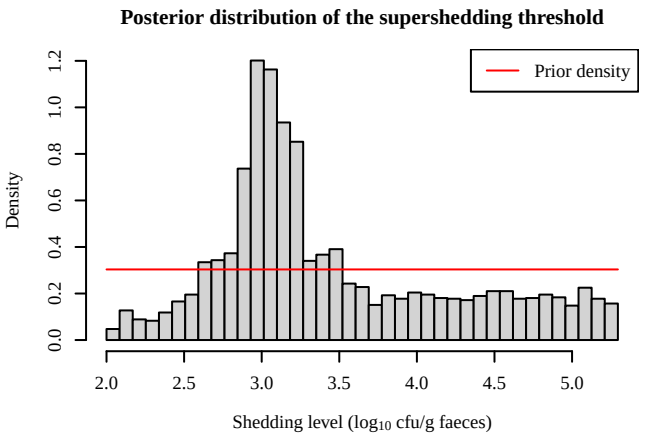
6 Extended model: Parameter posteriors

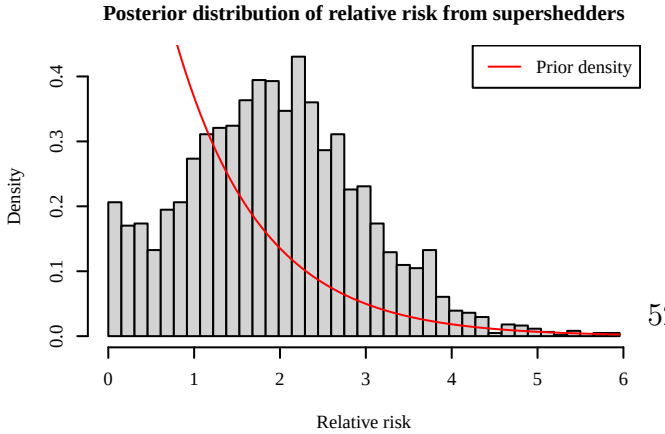
Posterior distributions for the parameters of the the model described in Main Text Section 2.6. In this model faecal material accumulates in the environment once it has been shed, before decaying away. This allows individuals to become colonized from animals that were shedding earlier in the study but are not shedding contemporaneously. The value of the supershedding threshold τ was inferred from the data. The final plot is a rescaled version of the posterior distribution fo the risk decay parameter δ.

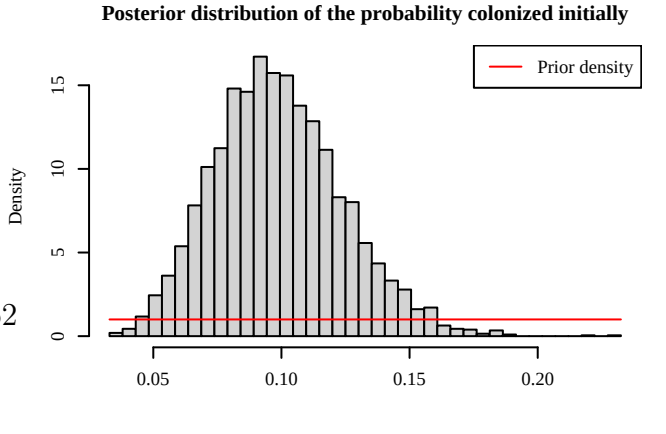


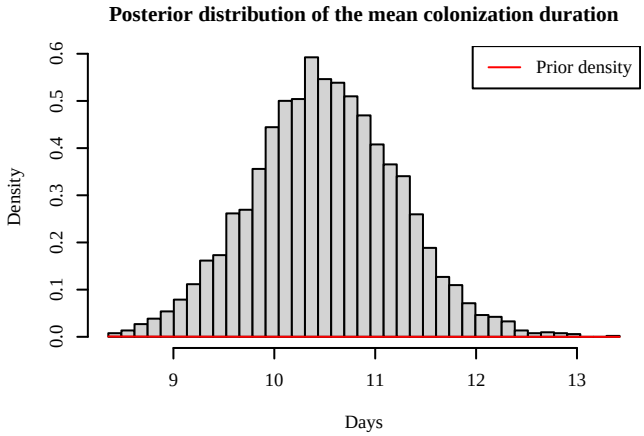


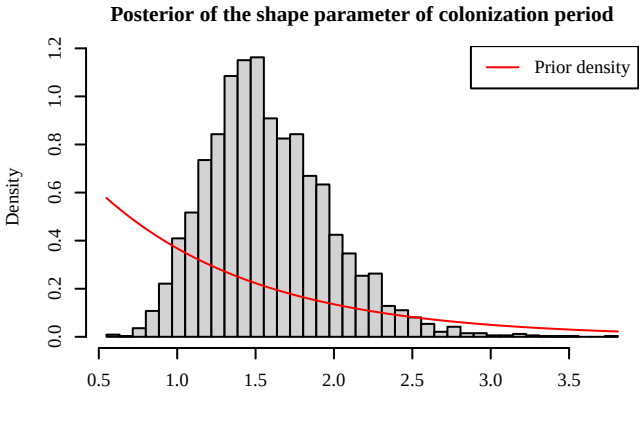


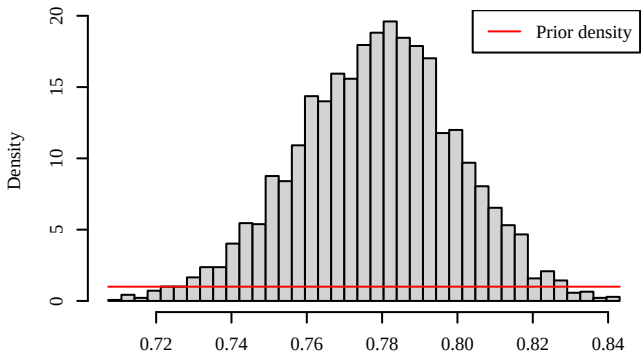


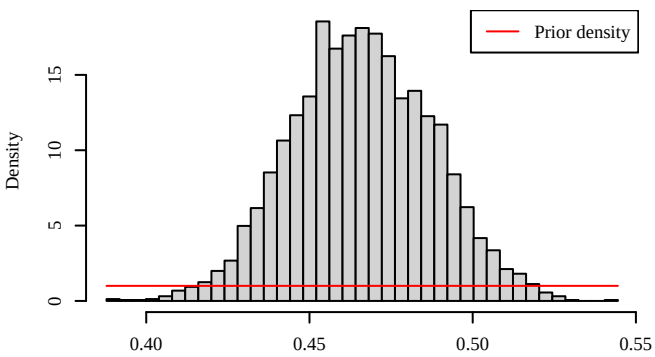


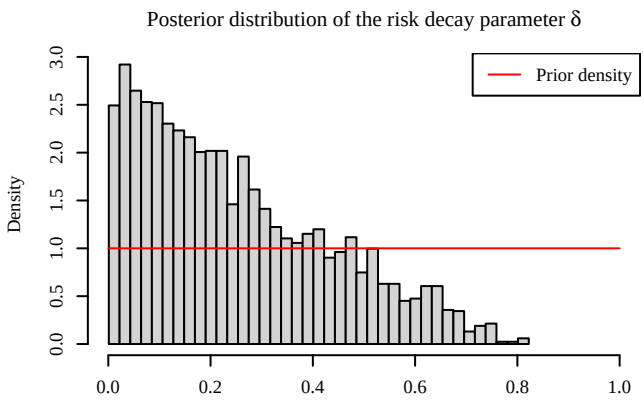


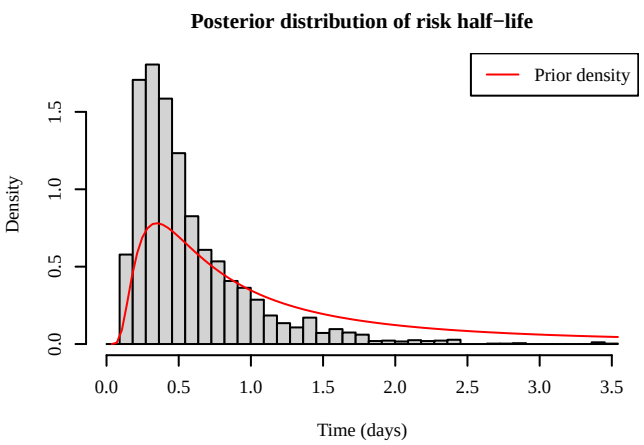

Posterior distribution of the mean colonization duration
Prior density
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
9
10
11
12
13
Days


Posterior of the shape parameter of colonization period
Prior density
Density
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.5
1.0
1.5
2.0
2.5
3.0
3.5


Posterior distribution of the sensitivity of RAMS
Prior density
Density
0
5
10
15
20
0.72
0.74
0.76
0.78
0.80
0.82
0.84


Posterior distribution of the sensitivity of faecal test
Prior density
Density
0
5
10
15
0.40
0.45
0.50
0.55


Posterior distribution of the risk decay parameter δ
Prior density
Density
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0.0
0.2
0.4
0.6
0.8
1.0


Posterior distribution of risk half−life
Prior density
Density
0.0
0.5
1.0
1.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Time (days)

References

[1] O'Neill PD, Roberts GO. 1999 Bayesian inference for partially observed stochastic epidemics. *J. R. Stat. Soc. A* **162**, 121–129.

[2] Cobbold RN, Hancock DD, Rice DH, Berg J, Stilborn R, Hovde CJ, Besser TE. 2007 Rectoanal junction colonization of feedlot cattle by *Escherichia coli* O157:H7 and its association with super-shedders and excretion dynamics. *Appl. Environ. Microbiol.* **73**, 1563–1568.